

00/61/90  
J5803 U.S. PTO**UTILITY PATENT APPLICATION TRANSMITTAL  
(Large Entity)***(Only for new nonprovisional applications under 37 CFR 1.53(b))*Docket No.  
5314.00

Total Pages in this Submission

187

**TO THE ASSISTANT COMMISSIONER FOR PATENTS**Box Patent Application  
Washington, D.C. 20231

Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application for an invention entitled:

**APPARATUS AND METHOD FOR PACKAGING PROGRAMS IN A  
TELEVISION PROGRAM DELIVERY SYSTEM**

and invented by:

**HENDRICKS, John S. and BONNER, Alfred E.**If a **CONTINUATION APPLICATION**, check appropriate box and supply the requisite information:☒ **Continuation** ☐ **Divisional** ☐ **Continuation-in-part (CIP)** of prior application No.: 08/912,934

Which is a:

☒ **Continuation** ☐ **Divisional** ☐ **Continuation-in-part (CIP)** of prior application No.: 08/160,282

Which is a:

☐ **Continuation** ☐ **Divisional** ☒ **Continuation-in-part (CIP)** of prior application No.: 07/991,074

Enclosed are:

**Application Elements**

1. ☒ Filing fee as calculated and transmitted as described below
2. ☒ Specification having 99 pages and including the following:
  - a. ☒ Descriptive Title of the Invention
  - b. ☒ Cross References to Related Applications *(if applicable)*
  - c. ☐ Statement Regarding Federally-sponsored Research/Development *(if applicable)*
  - d. ☐ Reference to Microfiche Appendix *(if applicable)*
  - e. ☒ Background of the Invention
  - f. ☒ Brief Summary of the Invention
  - g. ☒ Brief Description of the Drawings *(if drawings filed)*
  - h. ☒ Detailed Description
  - i. ☒ Claim(s) as Classified Below
  - j. ☒ Abstract of the Disclosure

jc784 U.S. PTO  
09/597891

06/19/00

# UTILITY PATENT APPLICATION TRANSMITTAL (Large Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.  
5314.00

Total Pages in this Submission

187

## Application Elements (Continued)

3. ☒ Drawing(s) (when necessary as prescribed by 35 USC 113)

a. ☒ Formal Number of Sheets 84

b. ☐ Informal Number of Sheets \_\_\_\_\_

4. ☒ Oath or Declaration

a. ☐ Newly executed (original or copy) ☐ Unexecuted

b. ☒ Copy from a prior application (37 CFR 1.63(d)) (for continuation/divisional application only)

c. ☐ With Power of Attorney ☐ Without Power of Attorney

d. ☐ DELETION OF INVENTOR(S)

Signed statement attached deleting inventor(s) named in the prior application,  
see 37 C.F.R. 1.63(d)(2) and 1.33(b).

5. ☒ Incorporation By Reference (usable if Box 4b is checked)

The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. ☐ Computer Program in Microfiche (Appendix)

7. ☐ Nucleotide and/or Amino Acid Sequence Submission (if applicable, all must be included)

a. ☐ Paper Copy

b. ☐ Computer Readable Copy (identical to computer copy)

c. ☐ Statement Verifying Identical Paper and Computer Readable Copy

## Accompanying Application Parts

8. ☐ Assignment Papers (cover sheet & document(s))

9. ☐ 37 CFR 3.73(B) Statement (when there is an assignee)

10. ☐ English Translation Document (if applicable)

11. ☐ Information Disclosure Statement/PTO-1449 ☐ Copies of IDS Citations

12. ☐ Preliminary Amendment

13. ☐ Acknowledgment postcard

14. ☐ Certificate of Mailing

☐ First Class ☐ Express Mail (Specify Label No.): \_\_\_\_\_

# UTILITY PATENT APPLICATION TRANSMITTAL (Large Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.  
5314.00

Total Pages in this Submission

187

## Accompanying Application Parts (Continued)

15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)

16. ☐ Additional Enclosures (please identify below):

## Fee Calculation and Transmittal

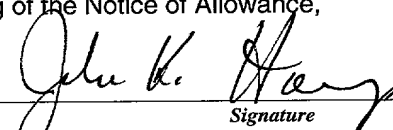
### CLAIMS AS FILED

For	#Filed	#Allowed	#Extra	Rate	Fee
Total Claims	55	- 20 =	35	x \$18.00	\$630.00
Indep. Claims	4	- 3 =	1	x \$78.00	\$78.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					\$0.00
BASIC FEE					\$690.00
OTHER FEE (specify purpose)					\$0.00
TOTAL FILING FEE					\$1,398.00

- ☒ A check in the amount of **\$1,398.00** to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge and credit Deposit Account No. **04-1425** as described below. A duplicate copy of this sheet is enclosed.
- ☐ Charge the amount of \_\_\_\_\_ as filing fee.
- ☒ Credit any overpayment.
- ☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
- ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Dated:

June 19, 2000

  
Signature  
John K. Harrop, Reg. No. 41,817  
DORSEY & WHITNEY llp  
1001 Pennsylvania Avenue, N.W.  
Suite 300 South  
Washington, D.C. 20004  
(202) 824-8821

CC:

# APPARATUS AND METHOD FOR PACKAGING PROGRAMS IN A TELEVISION PROGRAM DELIVERY SYSTEM

## Related Applications

This application is a continuation of co-pending U.S. Patent Application Serial Number 08/912,934, dated August 15, 1997, entitled AN OPERATIONS CENTER FOR A TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM, which is a continuation of U.S. Patent Application Serial Number 08/160,282, now U.S. Patent Number 5,659,350 entitled AN OPERATIONS CENTER FOR A TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM, which is a continuation-in-part of co-pending U.S. Patent Application Serial Number 07/991,074, filed December 9, 1992, entitled REMOTE CONTROL FOR MENU DRIVEN SUBSCRIBER ACCESS TO TELEVISION PROGRAMMING. These patents and patent applications are hereby incorporated by reference. The following other U.S. patents are also hereby incorporated by reference: U.S. Patent No. 5,798,785, dated August 25, 1998, entitled TERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM; U.S. Patent No. 5,600,364, dated February 4, 1997, entitled NETWORK CONTROLLER FOR CABLE TELEVISION DELIVERY SYSTEMS; U.S. Patent No. 5,600,573, dated February 4, 1997, entitled AN OPERATIONS CENTER WITH VIDEO STORAGE FOR A TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM, U.S. Patent No. 5,734,853, dated March 31, 1998, entitled SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEM, U.S. Patent No. 5,659,350, dated August 19, 1997, entitled AN OPERATIONS CENTER FOR A TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM; U.S. Patent No. 5,682,195, dated October 28, 1997, entitled DIGITAL CABLE HEADEND FOR CABLE TELEVISION DELIVERY SYSTEM; U.S. Patent No. 5,559,549, dated September 24, 1996, entitled TELEVISION PROGRAM DELIVERY SYSTEM; U.S. Patent No. 6,052,554, dated March 18, 2000, entitled DIGITAL PROGRAM SYSTEM; and U.S. Patent No. 5,986,690, dated November 16, 1999, entitled ELECTRONIC BOOK SELECTION AND DELIVERY SYSTEM.

## 1      **Technical Field**

2            The invention relates to television entertainment delivery systems that provide television  
3      programming to consumer homes. More particularly, the invention relates to an Operations  
4      Center that organizes and packages cable television programming for delivery to consumer  
5      homes.

## 6      **Background**

7            Advances in television entertainment have been primarily driven by breakthroughs in  
8      technology. In 1939, advances on Vladmir Zworykin's picture tube provided the stimulus for  
9      NBC to begin its first regular broadcasts. In 1975, advances in satellite technology provided  
10     consumers with increased programming to homes.

11           Many of these technology breakthroughs have produced inconvenient systems for  
12     consumers. One example is the ubiquitous three remote control home, having a separate and  
13     unique remote control for the TV, cable box and VCR. More recently, technology has  
14     provided cable users with 100 channels of programming. This increased program capacity is  
15     beyond the ability of many consumers to use effectively. No method of managing the program  
16     choices has been provided to consumers.

17           Consumers are demanding that future advances in television entertainment, particularly  
18     programs and program choices, be presented to the consumer in a user friendly manner.  
19     Consumer preferences, instead of technological breakthroughs, will drive the television  
20     entertainment market for at least the next 20 years. As computer vendors have experienced  
21     a switch from marketing new technology in computer hardware to marketing better useability,  
22     interfaces and service, the television entertainment industry will also experience a switch from  
23     new technology driving the market to consumer useability driving the market.

24           In order for new television entertainment products to be successful, the products must  
25     satisfy consumer demands. TV consumers wish to go from limited viewing choices to a variety  
26     of choices, from no control of programming to complete control. Consumers do not wish to

1 pay for one hundred channels when due to lack of programming information, they seldom, if  
2 ever, watch programming on many of these channels.

3 The concepts of interactive television, high definition television and 300-500 channel  
4 cable systems in consumer homes will not sell if they are not packaged, delivered and presented  
5 in a useable fashion to consumers. The problem is that TV programming is not being managed,  
6 packaged, delivered, and presented to consumers in a user friendly manner.

7 Consumers are already being bombarded with programming options, numerous "free"  
8 cable channels, subscription cable channels and pay-per-view choices. Any further increase  
9 in TV entertainment choices will likely bewilder viewers with a mind-numbing array of choices.

10 The TV industry has traditionally marketed and sold its programs to consumers in bulk,  
11 such as continuous feed broadcast and long-term subscriptions to movie channels. The TV  
12 industry is unable to sell its programming in large quantities on a per unit basis, such as the  
13 ordering of one program.

14 In today's television world networks manage the program lineup for individual channels.  
15 Each network analyzes ratings for television shows and determines the appropriate schedule  
16 or program lineup to gain market share and revenue from advertising. Since each channel is  
17 in competition with every other channel, there is no coordinated effort to organize television  
18 programming in a manner that primarily suits the viewers.

19 Additionally, viewership fragmentation, which has already begun to decrease a  
20 channel's or program's market share, will increase. Programming not presented in a user  
21 friendly manner will suffer with a decrease in viewership and revenue.

22 And finally, with the imminent introduction of digital television technology, current  
23 television delivery systems do not have the capabilities or features necessary to operate in the  
24 digital environment.

## 25 **Summary**

26 This invention is a center for controlling the operations of a digital television program  
27 delivery system. Specifically, the present invention is an Operations Center that allows for the

organizing and packaging of television programs for transmission in a television delivery system.

The Operations Center is the nerve center of the television program delivery system. It receives data on viewership behavior and utilizes the data to assist in packaging programs for future viewing. The Operations Center is a particularly useful invention for television delivery systems which will provide users with the ability to select programs from on-screen menus.

The Operations Center's primary component is a computer assisted packaging system (CAP), which makes use of the necessary hardware and software to control and transmit programming signals over a television delivery system. This computer assisted packaging system creates the program lineup or packaging of programs and the packaging of menu and control information for later transmission and use in the cable television systems. The CAP can be specially designed to generate graphical menu displays for user selection of programs. The hardware and software for controlling and transmitting programming signals over the television delivery system is particularly useful in large television delivery systems which include satellite transmissions to cable headends.

The software of the CAP performs the functions of gathering analog (and/or digital) program signals from a variety of sources such as broadcast television, premium channels, and video disk. The software also packages the programs efficiently for the available bandwidth and for subscriber viewing through computer assisted creation of program line-up and allocating of bandwidth. The line-ups are created to effectively group programming for display in menus by categories. The television programs are packaged with the program control information (such as cost for viewing certain program) and menu information.

The Operations Center of the present invention provides a method for remote management and control of local cable and CATV programs available and on-screen menu displays shown to subscribers. The Operations Center's computer software programs and hardware provide "real-time" control over cable and CATV systems. By transmitting appropriate control information the Operations Center has the ability to change allocation of

1 programs across physical channels, update menu information (from the Operations Center  
2 location), reprogram menu formats and menu flow, and change or augment a packaged  
3 program signal sent to a particular region of the country. The Operations Center is able to  
4 control remotely certain features and software of the set top terminals and if necessary  
5 reprogram menu display software stored at the set top terminals.

6 In order to properly manage program lineups, the Operations Center acquires viewer  
7 information on programs watched. Such viewer information includes information about the buy  
8 rates of specific shows, viewer preferences for programming, and the like, gathered by  
9 recording viewer transactions. A compilation of viewer information data is needed in order to  
10 make decisions on future individualized program lineup and program packaging. In addition,  
11 allocation of menu space and construction of menus is aided by the use of viewer information  
12 data. This information is received from the set top terminals using a feedback loop, usually  
13 through the cable headends.

14 The present invention is not only able to operate in the digital environment but  
15 introduces many new features to television program delivery.

### 16 **Description Of The Drawings**

17 Figure 1 is a diagram of the primary components of the television delivery system.

18 Figure 2 is an overview of the television delivery system operations.

19 Figure 3 is a schematic of the operation of the primary components of the system.

20 Figure 4 is a schematic of the primary components of the Computer Assisted  
21 Packaging System (CAP).

22 Figure 5 is a more detailed schematic of the hardware of the Operations Center and  
23 CAP.

24 Figure 6a is a chart of the program control information carried by the program control  
25 information signal.

26 Figure 6b shows a bit-wise data format for program control information.



1           Figure 7 is a block diagram showing a Delivery Control Processor Unit and a  
2 Computer Assisted Packaging Apparatus.

3           Figure 8 is a schematic of the subroutines for the CAP software.

4           Figure 9 is a software flowchart representing CAP operations.

5           Figure 10 is a diagram of the database structure for the databases supporting the  
6 operations of the CAP.

7           Figure 11 is a block diagram of the Operations Center and Master Control Site.

8           Figure 12 is a block diagram of the computer assisted packaging shown in figure 11.

9           Figure 13 is a flow chart of the processing occurring at the Operations Center.

10          Figure 14 is a diagram of the bandwidth allocation for a 750 MHz system.

11          Figure 15 is a diagram/chart of the compressed channel allocation for the system.

12          Figure 16 is a diagram showing how three cable television systems each with a different  
13 bandwidth may use the program delivery system and operations center of the present invention  
14 simultaneously.

15          Figure 17 is a diagram showing three different cable headend systems, each system  
16 receiving the entire satellite signal and stripping those parts of the signal which cannot be  
17 handled by the local cable system.

18          Figure 18 is a diagram showing dynamic change in bandwidth allocation from a typical  
19 week day prime time program signal to a Saturday afternoon program signal.

20          Figure 19 is a drawing of a broadcast television menu screen to be displayed on a set  
21 top terminal.

22          Figure 20 is a drawing of a hit movie menu screen to be displayed on a set top terminal.

23          Figure 21 is a drawing of a hit movie description menu screen to be displayed on a set  
24 top terminal.

25          Figure 22 is a flow chart of the progression of primary menus in the menu driven system  
26 of the set top terminal.

1           Figure 23a is a drawing of the basic menus used in the present invention, including the  
2           ten major menus represented by icons.

3           Figure 23b is a drawing of the basic menus used in the present invention, in addition to  
4           Figure 23a.

5           Figures 24a, 24b and 24c are drawings of introductory menus.

6           Figures 25a, 25b, 25c and 25d are drawings of home menus.

7           Figure 26 is a drawing of an alternative of a home menu.

8           Figures 27a, 27b, 27c, 27d, 27e, 27f and 27g are drawings of major menus.

9           Figures 28a and 28b are drawings of hit movie description menus.

10          Figures 29a and 29b are drawings of hit movie notification submenus.

11          Figure 30a is a drawing of a hit movie escape during program menu.

12          Figure 30b is a drawing of a hit movie during program hidden menu.

13          Figure 30c is a drawing of a hit movie re-entry submenu.

14          Figures 31a and 31b are drawings of menus related to high definition television  
15          programming.

16          Figures 32a, 32b, 32c, 32d, 32e and 32f are drawings of menus related to program  
17          guide services.

18          Figures 32g and 32h are drawings of broadcast television menus.

19          Figures 32i, 32j and 32k are drawings of mood question menus.

20          Figures 33a, 33b, and 33c are drawings of interactive television promotional menus,  
21          for Levels A-C.

22          Figures 33d, 33e, 33f, 33g, 33h, 33i and 33j are drawings of submenus for interactive  
23          television services, Level A.

24          Figures 34a, 34b, 34c, 34d, 34e, 34f, 34g, 34h, 34i, 34j, 34k and 34l are drawings  
25          of interactive services, Level B, particularly related to on-screen airline reservations.

26          Figures 35a, 35b, 35c, 35d and 35e are drawings of menus for digital audio services.

27          Figures 36a, 36b, 37a and 37b are drawings of monthly account menus.

## Detailed Description

### A. Television Program Delivery System Description

#### 1. Introduction

Figure 1 shows the present invention as part of an expanded cable television program delivery system 200 that dramatically increases programming capacity using compressed transmission of television program signals. Developments in digital bandwidth compression technology now allow much greater throughput of television program signals over existing or slightly modified transmission media. The program delivery system 200 shown provides subscribers with a user friendly interface to operate and exploit a six-fold or more increase in current program delivery capability.

Subscribers are able to access an expanded television program package and view selected programs through a menu-driven access scheme that allows each subscriber to select individual programs by sequencing a series of menus. The menus are sequenced by the subscriber using simple alpha-numeric and iconic character access or moving a cursor or highlight bar on the TV screen to access desired programs by simply pressing a single button, rather than recalling from memory and pressing the actual two or more digit numeric number assigned to a selection. Thus, with the press of a single button, the subscriber can advance from one menu to the next. In this fashion, the subscriber can sequence the menus and select a program from any given menu. The programs are grouped by category so that similar program offerings are found on the same menu.

#### 2. Major System Components

In its most basic form, the system uses a program delivery system 200 in conjunction with a conventional concatenated cable television system 210. The program delivery system 200 generally includes (i) at least one operations center 202, where program packaging and control information are created and then assembled in the form of digital data, (ii) a digital compression system, where the digital data is compressed, combined/multiplexed, encoded, and mapped into digital signals for satellite transmission to the cable headend 208, and (iii) a

1 set of in-home decompressors. The program delivery system 200 transports the digital signals  
2 to the cable headend 208 where the signals are transmitted through a concatenated cable  
3 television system 210. Within the cable headend 208, the received signals may be decoded,  
4 demultiplexed, managed by a local central distribution and switching mechanism, combined and  
5 then transmitted to the set top terminal 220 located in each subscriber's home over the cable  
6 system 210. Although concatenated cable systems 210 are the most prevalent transmission  
7 media to the home, telephone lines, cellular networks, fiberoptics, Personal Communication  
8 Networks and similar technology for transmitting to the home can be used interchangeably with  
9 this program delivery system 200.

10 The delivery system 200 has a reception region 207 with an in-home decompression  
11 capability. This capability is performed by a decompressor housed within a set top terminal  
12 220 in each subscriber's home. The decompressor remains transparent from the subscriber's  
13 point of view and allows any of the compressed signals to be demultiplexed and individually  
14 extracted from the composite data stream and then individually decompressed upon selection  
15 by the subscriber. The decompressed video signals are converted into analog signals for  
16 television display. Such analog signals include NTSC formatted signals for use by a standard  
17 television. Control signals are likewise extracted and decompressed and then either executed  
18 immediately or placed in local storage such as a RAM. Multiple sets of decompression  
19 hardware may be used to decompress video and control signals. The set top terminal 220 may  
20 then overlay or combine different signals to form the desired display on the subscriber's  
21 television. Graphics on video or picture-on-picture are examples of such a display.

22 Although a single digital compression standard (e.g., MPEG) may be used for both the  
23 program delivery system 200 and the concatenated cable system 210, the compression  
24 technique used may differ between the two systems. When the compression standards differ  
25 between the two media, the signals received by the cable headend 208 must be decompressed  
26 before transmission from the headend 208 to the set top terminals 220. Subsequently, the

1 cable headend 208 must recompress and transmit the signals to the set top terminal 220, which  
2 would then decompress the signals using a specific decompression algorithm.

3 The video signals and program control signals received by the set top terminal 220  
4 correspond to specific television programs and menu selections that each subscriber may  
5 access through a subscriber interface. The subscriber interface is a device with buttons located  
6 on the set top terminal 220 or on a portable remote control 900. In the preferred system  
7 embodiment, the subscriber interface is a combined alpha-character, numeric and iconic remote  
8 control device 900, which provides direct or menu-driven program access. The preferred  
9 subscriber interface also contains cursor movement and go buttons as well as alpha, numeric  
10 and iconic buttons. This subscriber interface and menu arrangement enables the subscriber to  
11 sequence through menus by choosing from among several menu options that are displayed on  
12 the television screen. In addition, a user may bypass several menu screens and immediately  
13 choose a program by selecting the appropriate alpha-character, numeric or iconic combinations  
14 on the subscriber interface. In the preferred embodiment, the set top terminal 220 generates  
15 the menus that are displayed on the television by creating arrays of particular menu templates,  
16 and the set top terminal 220 displays a specific menu or submenu option for each available  
17 video signal.

### 18 3. Operations Center and Digital Compression System

19 The operations center 202 performs two primary services, packaging television  
20 programs and generating the program control information signal. At the operations center 202,  
21 television programs are received from external program sources in both analog and digital form.  
22 Figure 2 shows an embodiment of the operations center receiving signals from various external  
23 sources 212. Examples of the external program sources are sporting events, children's  
24 programs, specialty channels, news or any other program source that can provide audio or  
25 visual signals. Once the programs are received from the external program sources, the  
26 operations center 202 digitizes (and preferably compresses) any program signals received in  
27 analog form. The operations center 202 may also maintain an internal storage of programs.

1 The internally stored programs may be in analog or digital form and stored on permanent or  
2 volatile memory sources, including magnetic tape or RAM. Subsequent to receiving  
3 programming, the operations center 202 packages the programs into the groups and categories  
4 which provide the optimal marketing of the programs to subscribers. For example, the  
5 operations center 202 may package the same programs into different categories and menus for  
6 weekday, prime-time viewing and Saturday afternoon viewing. Also, the operations center 202  
7 packages the television programs in a manner that enables both the various menus to easily  
8 represent the programs and the subscribers to easily access the programs through the menus.

9 The packaging of the digital signals is typically performed at the operations center 202  
10 by computer assisted packaging equipment (CAP). The CAP system normally includes at least  
11 one computer monitor, keyboard, mouse, and standard video editing equipment. A  
12 programmer packages the signals by entering certain information into the CAP. This  
13 information includes the date, time slot, and program category of the various programs. The  
14 programmer and the CAP utilize demographic data and ratings in performing the packaging  
15 tasks. After the programmer selects the various programs from a pool of available programs  
16 and inputs the requisite information, the programmer, with assistance from the CAP, can select  
17 the price and allocate transponder space for the various programs. After the process is  
18 complete, the CAP displays draft menus or program schedules that correspond to the entries  
19 of the programmer. The CAP may also graphically display allocation of transponder space.  
20 The programmer may edit the menus and transponder allocation several times until satisfied with  
21 the programming schedule. During the editing, the programmer may direct the exact location  
22 of any program name on a menu with simple commands to the CAP.

23 The packaging process also accounts for any groupings by satellite transponder which  
24 are necessary. The operations center 202 may send different groups of programs to different  
25 cable headends 208 and/or set top terminals 220. One way the operations center 202 may  
26 accomplish this task is to send different program packages to each transponder. Each  
27 transponder, or set of transponders, then relays a specific program package to specific cable

1 headends 208 and/or set top terminals 220. The allocation of transponder space is an  
2 important task performed by the operations center 202.

3 The operations center 202 may also "insert" directions for filling local available program  
4 time in the packaged signal to enable local cable and television companies to fill the program  
5 time with local advertising and/or local programming. Consequently, the local cable headends  
6 208 are not constrained to show only programs transmitted from the operations center 202.  
7 New set top converters will incorporate both digital and analog channels. Therefore, the cable  
8 headend 208 may combine analog signals with the digital signals prior to transmitting the  
9 program signals to the set top terminals 220.

10 After the CAP packages the programs, it creates a program control information signal  
11 to be delivered with the program package to the cable headend 208 and/or set top terminal  
12 220. The program control information signal contains a description of the contents of the  
13 program package, commands to be sent to the cable headend 208 and/or set top terminal 220,  
14 and other information relevant to the signal transmission.

15 In addition to packaging the signal, the operations center 202 employs digital  
16 compression techniques to increase existing satellite transponder capacity by at least a 4:1 ratio,  
17 resulting in a four-fold increase in program delivery capability. A number of digital compression  
18 algorithms currently exist which can achieve the resultant increase in capacity and improved  
19 signal quality desired for the system. The algorithms generally use one or more of three basic  
20 digital compression techniques: (1) within-frame (intraframe) compression, (2) frame-to-frame  
21 (interframe) compression, and (3) within carrier compression. Specifically, in the preferred  
22 embodiment, the MPEG 2 compression method is used. After digital compression, the signals  
23 are combined (multiplexed) and encoded. The combined signal is subsequently transmitted to  
24 various uplink sites 204.

25 There may be a single uplink site 204 or multiple uplink sites (represented by 204',  
26 shown in phantom in Figure 1) for each operation center 202. The uplink sites 204 may either  
27 be located in the same geographical place or may be located remotely from the operations

1 center 202. Once the composite signal is transmitted to the uplink sites 204, the signal may be  
2 multiplexed with other signals, modulated, upconverted and amplified for transmission over  
3 satellite. Multiple cable headends 208 may receive such transmissions.

4 In addition to multiple uplinks, the delivery system 200 may also contain multiple  
5 operations centers. The preferred method for using multiple operations centers is to designate  
6 one of the operations centers as a master operations center and to designate the remaining  
7 operations centers as slave operations centers. In this configuration, the master operations  
8 center coordinates various functions among the slave operations centers such as synchronization  
9 of simultaneous transmissions and distributes the operations workload efficiently.

#### 10 4. Cable Headend

11 After the operations center 202 has compressed and encoded the program signals and  
12 transmitted the signals to the satellite, the cable headend 208 receives and further processes  
13 the signals before they are relayed to each set top terminal 220. Each cable headend site is  
14 generally equipped with multiple satellite receiver dishes. Each dish is capable of  
15 handling multiple transponder signals from a single satellite and sometimes from multiple  
16 satellites.

17 With reference to Figure 3, as an intermediary between the set top terminals 220 and  
18 the operations center 202 and master control uplink site 211 (or other remote site), the cable  
19 headend 208 performs two primary functions. First, the cable headend 208 acts as a  
20 distribution center, or signal processor, by relaying the program signal to the set top terminal  
21 220 in each subscriber's home. In addition, the cable headend 208 acts as a network  
22 controller 214 by receiving information from each set top terminal 220 and passing such  
23 information on to an information gathering site such as the operations center 202.

24 Figure 3 shows an embodiment where the cable headend 208 and the subscriber's  
25 home are linked by certain communications media 216. In this particular embodiment, analog  
26 signals, digitally compressed signals, other digital signals and up-stream/interactivity signals are



1 sent and received over the media 216. The cable headend 208 provides such signaling  
2 capabilities in its dual roles as a signal processor 209 and network controller 214.

3 As a signal processor 209, the cable headend 208 prepares the program signals that  
4 are received by the cable headend 208 for transmission to each set top terminal 220. In the  
5 preferred system, the signal processor 209 re-routes or demultiplexes and recombines the  
6 signals and digital information received from the operations center 202 and allocates different  
7 portions of the signal to different frequency ranges. Cable headends 208 which offer different  
8 subscribers different program offerings may allocate the program signals from the operations  
9 center 202 in various manners to accommodate different viewers. The signal processor 209  
10 may also incorporate local programming and/or local advertisements into the program signal  
11 and forward the revised signal to the set top terminals 220. To accommodate this local  
12 programming availability, the signal processor 209 must combine the local signal in digital or  
13 analog form with the operations center program signals. If the local cable system uses a  
14 compression standard that is different than the one used by the operations center 202, the signal  
15 processor 209 must also decompress and recompress incoming signals so they may be  
16 properly formatted for transmission to the set top terminals 220. This process becomes less  
17 important as standards develop (i.e., MPEG 2). In addition, the signal processor 209 performs  
18 any necessary signal decryption and/or encryption.

19 As a network controller 214, the cable headend 208 performs the system control  
20 functions for the system. The primary function of the network controller 214 is to manage the  
21 configuration of the set top terminals 220 and process signals received from the set top  
22 terminals 220. In the preferred embodiment, the network controller 214 monitors, among other  
23 things, automatic poll-back responses from the set top terminals 220 remotely located at each  
24 subscribers' home. The polling and automatic report-back cycle occurs frequently enough to  
25 allow the network controller 214 to maintain accurate account and billing information as well  
26 as monitor authorized channel access. In the simplest embodiment, information to be sent to  
27 the network controller 214 will be stored in RAM within each subscriber's set top terminal 220

1 and will be retrieved only upon polling by the network controller 214. Retrieval may, for  
2 example, occur on a daily, weekly or monthly basis. The network controller 214 allows the  
3 system to maintain complete information on all programs watched using a particular set top  
4 terminal 220.

5 The network controller 214 is also able to respond to the immediate needs of a set top  
6 terminal 220 by modifying a program control information signal received from the operations  
7 center 202. Therefore, the network controller 214 enables the delivery system to adapt to the  
8 specific requirements of individual set top terminals 220 when the requirements cannot be  
9 provided to the operations center 202 in advance. In other words, the network controller 214  
10 is able to perform "on the fly programming" changes. With this capability, the network  
11 controller 214 can handle sophisticated local programming needs such as, for example,  
12 interactive television services, split screen video, and selection of different foreign languages for  
13 the same video. In addition, the network controller 214 controls and monitors all compressors  
14 and decompressors in the system.

15 The delivery system 200 and digital compression of the preferred embodiment provides  
16 a one-way path from the operations center 202 to the cable headend 208. Status and billing  
17 information is sent from the set top terminal 220 to the network controller 214 at the cable  
18 headend 208 and not directly to the operations center 202. Thus, program monitoring and  
19 selection control will take place only at the cable headend 208 by the local cable company and  
20 its decentralized network controllers 214 (i.e., decentralized relative to the operations center  
21 202, which is central to the program delivery system 200). The local cable company will in turn  
22 be in communication with the operations center 202 or a regional control center (not shown)  
23 which accumulates return data from the set top terminal 220 for statistical or billing purposes.  
24 In alternative system embodiments, the operations center 202 and the statistical and billing sites  
25 are collocated. Further, telephone lines with modems are used to transfer information from the  
26 set top terminal 220 to the statistical and billing sites.

1                   5.     Set Top Terminal

2             The set top terminal 220 is the portion of the delivery system 200 that resides in the  
3     home of a subscriber. The set top terminal 220 is usually located above or below the  
4     subscriber's television, but it may be placed anywhere in or near the subscriber's home as long  
5     as it is within the range of the subscriber's remote control device 900. In some aspects, the set  
6     top terminal 220 may resemble converter boxes already used by many cable systems. For  
7     instance, each set top terminal 220 may include a variety of error detection, decryption, and  
8     coding techniques such as anti-taping encoding. However, it will become apparent from the  
9     discussion below that the set top terminal 220 is able to perform many functions that an  
10    ordinary converter box cannot perform.

11            The set top terminal 220 has a plurality of input and output ports to enable it to  
12    communicate with other local and remote devices. The set top terminal 220 has an input port  
13    that receives information from the cable headend 208. In addition, the unit has at least two  
14    output ports which provide communications from the set top terminal 220 to a television and  
15    a VCR. Certain menu selections may cause the set top terminal 220 to send control signals  
16    directly to the VCR to automatically program or operate the VCR. Also, the set top terminal  
17    220 contains a phone jack which can be used for maintenance, trouble shooting,  
18    reprogramming and additional customer features. The set top terminal 220 may also contain  
19    stereo/audio output terminals and a satellite dish input port.

20            Functionally, the set top terminal 220 is the last component in the delivery system chain.  
21    The set top terminal 220 receives compressed program and control signals from the cable  
22    headend 208 (or, in some cases, directly from the operations center 202). After the set top  
23    terminal 220 receives the individually compressed program and control signals, the signals are  
24    demultiplexed, decompressed, converted to analog signals (if necessary) and either placed in  
25    local storage (from which the menu template may be created), executed immediately, or sent  
26    directly to the television screen.

1           After processing certain signals received from the cable headend 208, the set top  
2           terminal 220 is able to store menu templates for creating menus that are displayed on a  
3           subscriber's television by using an array of menu templates. Before a menu can be constructed,  
4           menu templates must be created and sent to the set top terminal 220 for storage. A  
5           microprocessor uses the control signals received from the operations center 202 or cable  
6           headend 208 to generate the menu templates for storage. Each menu template may be stored  
7           in volatile memory in the set top terminal 220. When the set top terminal receives template  
8           information it demultiplexes the program control signals received from the cable headend 208  
9           into four primary parts: video, graphics, program logic and text. Each menu template  
10          represents a different portion of a whole menu, such as a menu background, television logo,  
11          cursor highlight overlay, or other miscellaneous components needed to build a menu. The menu  
12          templates may be deleted or altered using control signals received from the operations center  
13          202 or cable headend 208.

14          Once the menu templates have been stored in memory, the set top terminal 220 can  
15          generate the appropriate menus. In the preferred embodiment, the basic menu format  
16          information is stored in memory located within the set top terminal 220 so that the  
17          microprocessor may locally access the information from the set top terminal instead of from an  
18          incoming signal. The microprocessor next generates the appropriate menus from the menu  
19          templates and the other menu information stored in memory. The set top terminal 220 then  
20          displays specific menus on the subscriber's television screen that correspond to the inputs the  
21          subscriber selects.

22          If the subscriber selects a specific program from a menu, the set top terminal 220  
23          determines on which channel the program is being shown, demultiplexes and extracts the single  
24          channel transmitted from the cable headend 208. The set top terminal 220 then decompresses  
25          the channel and, if necessary, converts the program signal to an analog NTSC signal to enable  
26          the subscriber to view the selected program. The set top terminal 220 can be equipped to  
27          decompress more than one program signal, but this would unnecessarily add to the cost of the

1 unit since a subscriber will generally only view one program at a time. However, two or three  
2 decompressors may be desirable to provide picture-on-picture capability, control signal  
3 decompression, enhanced channel switching or like features.

4 In addition to menu information, the set top terminal 220 may also store text transmitted  
5 from the cable headend 208 or the operations center 202. The text may inform the subscriber  
6 about upcoming events, billing and account status, new subscriptions, or other relevant  
7 information. The text will be stored in an appropriate memory location depending on the  
8 frequency and the duration of the use of the textual message.

9 Also, optional upgrades are available to enhance the performance of a subscriber's set  
10 top terminal 220. These upgrades may consist of a cartridge or computer card (not shown)  
11 that is inserted into an expansion slot in the set top terminal 220 or may consist of a feature  
12 offered by the cable headend 208 or operations center 202 to which the user may subscribe.  
13 Available upgrades may include on line data base services, interactive multi-media services,  
14 access to digital radio channels, and other services.

15 In the simplest embodiment, available converter boxes such as those manufactured by  
16 General Instruments or Scientific Atlanta, may be modified and upgraded to perform the  
17 functions of a set top terminal 220. The preferred upgrade is a circuit card with a  
18 microprocessor which is electronically connected to or inserted into the converter box.

#### 19 6. Remote Control Device

20 The primary conduit for communication between the subscriber and the set top terminal  
21 220 is through the subscriber interface, preferably a remote control device 900. Through this  
22 interface, the subscriber may select desired programming through the system's menu-driven  
23 scheme or by directly accessing a specific channel by entering the actual channel number.  
24 Using the interface, the subscriber can navigate through a series of informative program  
25 selection menus. By using menu-driven, iconic or alpha-character access, the subscriber can  
26 access desired programs by simply pressing a single button rather than recalling from memory  
27 and pressing the actual channel number to make a selection. The subscriber can access regular

1 broadcast and basic cable television stations by using either the numeric keys on the remote  
2 control 900 (pressing the corresponding channel number), or one of the menu icon selection  
3 options.

4 In addition to enabling the subscriber to easily interact with the cable system 200, the  
5 physical characteristics of the subscriber interface 900 should also add to the user friendliness  
6 of the system. The remote control 900 should easily fit in the palm of the user's hand. The  
7 buttons of the preferred remote control 900 contain pictorial symbols that are easily identifiable  
8 by the subscriber. Also, buttons that perform similar functions may be color coordinated and  
9 consist of distinguishing textures to increase the user friendliness of the system.

#### 10 7. Menu-Driven Program Selection

11 The menu-driven scheme provides the subscriber with one-step access to all major  
12 menus, ranging from hit movies to sport specials to specialty programs. From any of the major  
13 menus, the subscriber can in turn access submenus and minor menus by cursor or alpha-  
14 character access.

15 There are two different types of menus utilized by the preferred embodiment, the  
16 Program Selection menus and the During Program menus. The first series of menus, Program  
17 Selection menus, consists of an Introductory, a Home, Major menus, and Submenus. The  
18 second series of menus, During Program menus, consists of two primary types, Hidden menus  
19 and the Program Overlay menus.

20 Immediately after the subscriber turns on the set top terminal 220, the Introductory  
21 menu welcomes the subscriber to the system. The Introductory menu may display important  
22 announcements from the local cable franchise, advertisements from the cable provider, or other  
23 types of messages. In addition, the Introductory menu can inform the subscriber if the cable  
24 headend 208 has sent a personal message to the subscriber's particular set top terminal 220.

25 After the Introductory menu has been displayed the subscriber may advance to the next  
26 level of menus, namely the Home menu. In the preferred embodiment, after a certain period  
27 of time, the cable system will advance the subscriber by default to the Home menu. From the

1 Home menu, the subscriber is able to access all of the programming options. The subscriber  
2 may either select a program directly by entering the appropriate channel number from the  
3 remote control 900, or the subscriber may sequence through incremental levels of menu options  
4 starting from the Home menu. The Home menu lists categories that correspond to the first level  
5 of menus called Major menus.

6 If the subscriber chooses to sequence through subsequent menus, the subscriber will  
7 be forwarded to the Major menu that corresponds to the chosen category from the Home  
8 menu. The Major menus further refine a subscriber's search and help guide the subscriber to  
9 the selection of his choice.

10 From the Major menus, the subscriber may access several submenus. From each  
11 submenu, the subscriber may access other submenus until the subscriber finds a desired  
12 television program. Similar to the Major menu, each successive level of Submenus further  
13 refines the subscriber's search. The system also enables the subscriber to skip certain menus  
14 or submenus and directly access a specific menu or television program by entering the  
15 appropriate commands on the remote control 900.

16 The During program menus (including Hidden Menus and Program Overlay Menus)  
17 are displayed by the set top terminal 220 only after the subscriber has selected a television  
18 program. In order to avoid disturbing the subscriber, the set top terminal 220 does not display  
19 the Hidden Menus until the subscriber selects the appropriate option to display a Hidden Menu.  
20 The Hidden Menus contain options that are relevant to the program selected by the viewer.  
21 For example, a Hidden Menu may contain options that enable a subscriber to enter an  
22 interactive mode or escape from the selected program.

23 Program Overlay Menus are similar to Hidden Menus because they occur during a  
24 program and are related to the program being viewed. However, the Program Overlay Menus  
25 are displayed concurrently with the program selected by the subscriber. Most Program  
26 Overlay Menus are small enough on the screen to allow the subscriber to continue viewing the  
27 selected program comfortably.

1           B.     Operations Center With Computer Assisted Packaging System

2           Figure 4 broadly shows the configuration for the computer assisted packaging system  
3 (CAP) 260 of the Operations Center 202. The primary components of the CAP 260 consist  
4 of multiple packager workstations 262, a central processing unit 264, video/audio editing  
5 equipment 266, and one or more databases 268 and 269. Additional remotely located  
6 databases, such as local video storage database 267, and buffers 271 and controllers 272 for  
7 external program feeds make up the peripherals of the CAP system 260.

8           The heart of the CAP 260 is a central processing unit 264 which communicates with  
9 all the component parts of the CAP 260. The central processing unit 264 can be a powerful  
10 PC, a mini-computer, a mainframe or a combination of computing equipment running in parallel.  
11 The central processing unit 264 includes all the necessary interconnections to control peripheral  
12 equipment such as the external video controls 272. The central processing unit 264 has  
13 sufficient memory 274 to store the program instructions of the subroutines which operate the  
14 CAP 260.

15           The CAP 260 receives data from one or more databases, such as the Operations  
16 Center Database 268 and the Cable Franchise Information Database 269 shown in Figure 4.  
17 In addition, separate databases are maintained of viewer information, such as demographics  
18 and programs viewed. The CAP 260 can control the reception of external sources by enabling  
19 and disabling the external video controls 272. The external video controls 272 include  
20 buffers to delay as necessary external programs received by the Operations Center 202.

21           The functions of the video/audio equipment 266 include digitizing analog programs,  
22 digitizing and compressing analog programs (in a single step, e.g., MPEG), and compressing  
23 digital program signals as requested by the central processing unit 264.

24           The CAP 260 receives video and audio from two sources: internally from a local video  
25 storage 267 and externally from external sources through external video controls 272. When  
26 necessary, video is manipulated, formatted and/or digitized using video/audio equipment 266  
27 which is controlled by CAP 264.



1 Referring back to Figure 2, an overview of an operating cable television menu driven  
2 program delivery system 200 highlighting various external programming signal sources 212 is  
3 depicted. The Operations Center 202 is shown receiving external programming signals which  
4 correspond to particular programming categories that are available for a subscriber's viewing.  
5 These external signals may be in analog or digital form and may be received via landline,  
6 microwave transmission, or satellite. Some of these external signals may be transmitted from  
7 the program source 212 to the Operations Center 202 in compressed digital format or other  
8 nonstandard digital formats. These external signals are received and packaged with  
9 programming that is stored at the Operations Center 202.

10 Examples of external program sources 212 shown in Figure 2 are: Sporting events,  
11 children's programs, documentaries, high definition TV sources, specialty channels, interactive  
12 services, weather, news, and other nonfiction or entertainment. Any source that can provide  
13 either audio or video or both may be utilized to provide programming to the Operations Center  
14 202.

15 In order to achieve the required throughput of video and audio information for the  
16 system, digital compression techniques are employed. A television signal is first digitized. The  
17 object of digitization is two-fold: First, in the case of an analog signal, like a television picture,  
18 digitization allows the signal to be converted from a waveform into a digital binary format.  
19 Secondly, through the use of digital compression techniques, standard digital formats are  
20 designed to have the resulting pictures or video stills take up less space on their respective  
21 storage mediums. Essentially, as described below, a standard digital format will define the  
22 method of compression used.

23 There are three basic digital compression techniques: within-frame (intraframe), frame-  
24 to-frame (interframe), and within-carrier. Intraframe compression processes each frame in a  
25 television picture to contain fewer visual details and, therefore, the picture contains fewer digital  
26 bits. Interframe compression transmits only changes between frames, thus omitting elements  
27 repeated in successive frames. Within-carrier compression allows the compression ratio to

1 dynamically vary depending upon the amount of changes between frames. If a large number  
2 of changes occur between frames, the compression ratio drops from, for example, sixteen-to-  
3 one to eight-to-one. If action is intense, the compression ratio may dip to four to one.

4 Several standard digital formats representing both digitizing standards and compression  
5 standards have been developed. For example, JPEG (joint photographic experts group) is a  
6 standard for single picture digitization. Motion picture digitization may be represented by  
7 standards such as MPEG or MPEG2 (motion picture engineering group specifications). Other  
8 proprietary standards have been developed in addition to these. The preferred embodiment  
9 uses the MPEG-2 standard of coding and those of ordinary skill in the art are presumed to be  
10 familiar with the MPEG-2 standard. The MPEG-2 Systems Working Draft Proposal from the  
11 Systems Committee of the International Organization For Standardization, document ISO/IE  
12 JT1/SC29/WG11 "N0531" MPEG93 dated September 10, 1993, is hereby incorporated by  
13 reference. Although MPEG and MPEG2 for motion pictures are preferred in the present  
14 invention, any reliable digital format with compression may be used with the present invention.

15 Various hybrids of the above compression techniques have been developed by several  
16 companies including AT&T, Compression Labs, Inc., General Instrument, Scientific-Atlanta,  
17 Phillips, and Zenith. As is known by those skilled in the art, any of the compression techniques  
18 developed by these companies, and other known techniques, may be used with the present  
19 invention.

20 With reference to Figure 4, the human intervention in this system is conducted by a  
21 programmer or program packager operating from the one or more work stations 262  
22 connected to the system. These work stations 262 are preferably intelligent work stations with  
23 large CRT screens. In the preferred embodiment, a suitable keyboard, mouse and color  
24 monitor are used with the workstation. From these work stations, the packager can create  
25 program lineups, prioritize programs, initiate dynamic menu allocation, initiate dynamic  
26 bandwidth allocation, design menus, place program names and descriptions onto menus, create

1 menus with still and live video, move text on menus, change the colors of objects on menus and  
2 perform various other tasks for the program delivery system 200.

3 Almost any Operations Center 202 function that normally requires human intervention  
4 can be conducted at the packager workstation 262. Although data entry for the databases can  
5 be performed manually at the workstations 262, it is preferred that the data entry be completed  
6 through electronic transfers of information. Alternatively, the data can be loaded from  
7 customary portable storage media such as magnetic disks or tape.

8 An integral part of the Computer Assisting Packaging system is the retrieval of viewer  
9 data, and the assimilation of that data into the program packaging method (especially the menu  
10 configuration) as discussed in reference to Figure 8 MII 402. This involves two main steps,  
11 first, retrieval of raw data from the set top terminals, and then filtering and presenting that data.  
12 Each headend 208 compiles the viewer data, and then sends it verbatim to the Operations  
13 Center 202. This raw data is necessary because different responsibilities of the Operations  
14 Center 202 require different parts of the raw information. Also a record must be kept of  
15 overall data. Once the data is assembled at the Operations Center 202, the data is filtered for  
16 each application.

17 The raw data gathered includes but is not limited to:

- 18 • What programs a viewer purchased and when it was purchased
- 19 • What channel a specific viewer watched and for how long.

20 This information can then be used to calculate the following:

- 21 • How many viewers watched a particular program.
- 22 • Peak viewing times for different categories of shows.
- 23 • Buy rates for particular menu positions.

24 Menu creation, both automatically and manually, is one of the major CAP functions that  
25 involves the incorporation of the raw data. An automated software procedure (such as the  
26 EIS) analyzes the data and, using certain heuristics, creates the menus.

1           One heuristic, for example, is that when a show is not ordered frequently, it is moved  
2 closer to the top of the menu for greater visibility. The filtering of the data allows it to be sorted  
3 and indexed for display to the user. The program data can be filtered into a new database  
4 containing program names and indexed by the number of times each program was purchased.  
5 The data can also be indexed by buy times and program categories.

6           Certain metrics are established to help in evaluating the data. Using the EIS or similar  
7 software, sales by menu placement, cost, category and lifespan can be pulled up for viewing  
8 in graphic presentation. The graphic presentation, in the form of line or bar graphs, help the  
9 packager recognize any trends in the data. For example, the first movie on a movie menu might  
10 not have sold as well as a second movie listed. A chart can be pulled up to reveal that the first  
11 movie has been at the top of the menu for two weeks and buy rates are naturally falling off.  
12 Steps can then be taken to move items in the menus to correct this, though many of these steps  
13 are automated in the menu creation system. Suggested changes can be displayed to help the  
14 user in this task.

15           The automated procedures create menus that are distinct between headends 208  
16 because of demographic differences in the viewing audience. To help with this, a separate  
17 database of viewer demographics exists and is frequently updated. The headends 208 are able  
18 to alter the menu positions in order to further tailor the presentation, or to add local shows.  
19 Any changes to the menus are sent back to the Operations Center 202 at the same time as the  
20 viewer data, in order to prevent erroneous data analysis. Menu changes at the cable headend  
21 are described in detail in U.S. Patent Application Ser. No. 08/160,280, filed December 2,  
22 1993, entitled NETWORK CONTROLLER FOR A CABLE TELEVISION SYSTEM, U.S.  
23 Patent No. 5,600,364.

24           Another use for the indexed data is creation of marketing reports. Programming  
25 changes are helped by accurate information on viewer preference. Also viewer purchasing  
26 trends, and regional interests can be tracked.

1 In the preferred embodiment, an Executive Information System (EIS) is used to give  
2 high level access to both "buy" (what the customer purchases) and "access" (when the product  
3 was viewed, how often and duration) data. The EIS represents information in both a graphical  
4 and summary report format. "Drill down" functions in the EIS help the packager derive the  
5 appropriate product (product refers to programs, events or services) mix.

6 The purpose of the EIS is to provide an on-line software tool that will allow for real-  
7 time evaluation of current product positioning. The design of the system consists of user  
8 friendly icons to guide the user through available functions. The functionality in the system  
9 provides general information on current programming sales status. By working through the tiers  
10 in the system, the user has access to more specific information. The system is designed to  
11 shield the user from a long learning curve and information overload.

12 The graphical tools allow for analysis of current data through the use of multiple graph  
13 types such as line graphs, bar and pie charts. These tools will allow the user to manipulate  
14 independent variables such as time (hour, day of the week, week, month), demographic  
15 information, program category information (genre, property, events), headend information and  
16 pricing information for determining the appropriate programming mix within the allotted time  
17 slots.

18 The system also allows the packager to derive expected monetary returns through  
19 program line-ups by integrating outside industry databases. For instance, the system could be  
20 used to determine expected returns from a particular program by correlating buy information  
21 from the existing programs in the line up with a viewer ratings service database to determine  
22 the outcome of programs within a particular genre not in the current line up.

23 Report tools within the EIS aggregate buy access at the highest level. Due to the  
24 volume of available information statistical analysis methods are used for deriving marketing  
25 intelligence within the EIS.

26 A yield management tool is incorporated within the EIS. The yield management tool  
27 encompasses operations research techniques, statistical methods and neural net technology to

1 decide program mix as it pertains to program substitutes, program complements, time slice  
2 positioning, repetitions and menu positioning.

3 This system is automated to the extent of providing viable alternative as to the proposed  
4 product mix. The system encompasses a Monte Carlo simulation for developing alternative  
5 product mix scenarios. The system feeds from both internal data and external industry data  
6 sources to provide expected revenue projections for the different scenarios. Other software  
7 subroutines of the CAP will automatically call upon the EIS to assist the program in  
8 important decision making, such as menu configuration and transponder allocation. Human  
9 interaction is required to change marketing parameters for fine tuning the desired product  
10 scheduling.

11 Although the packaging of the program information and programs, including the  
12 creation of program control information, program lineup and menu designing configuration, is  
13 conducted at the CAP 260, all other functions of the Operations Center 202 can be controlled  
14 by a second separate processing unit (shown in Figure 5 at 270). This second processing unit  
15 270 is the Delivery Control Processing Unit 270, and can perform the tasks of incorporating  
16 the program control information signal from the CAP 260, coordinating the receipt and  
17 combining of external program video/audio and internal video/audio and combining the signals  
18 as necessary for transmission. This distribution of functions among the CAP 260 and Delivery  
19 Control Processing Unit 270 allows for greater speed and ease of use.

20 Figure 5 shows a more detailed diagram of the CAP 260 and the Delivery Control  
21 Processor Unit 270. Once external and stored digital and analog sources have been converted  
22 into a standard digital format 274, they are input into standard digital multiplex equipment 273  
23 (of the type manufactured by Scientific Atlanta, General Instruments, and others). Additionally,  
24 the Program Control Information Signal 276 is input into the digital multiplex equipment 273.  
25 These inputs 274, 276 are multiplexed appropriately under the control of the Delivery Control  
26 Processor Unit 270 as commanded by the CPU 264. The Delivery Control Processor Unit  
27 270 is also responsible for the generation of the Program Control Information Signal 276 based

1 on information received from the CPU 264. The Delivery Control Processor Unit 270 allows  
2 for the off-loading of real-time and near real-time tasks from the CPU 264. The CPU 264, as  
3 described earlier, processes information within its database and provides user access to the  
4 CAP 260 via multiple user workstations 262. The high-speed digital output 278 from the  
5 digital multiplex equipment 273 is then sent on to the compression (if necessary), multiplexing,  
6 modulation and amplification hardware, represented at 279.

7 C. The Program Control Information Signal

8 The following table, TABLE A, is an example of some information that can be sent in  
9 the program control information signal to the set top terminals 220. The program control  
10 information signal generated by the Operations Center 202 provides data on the scheduling and  
11 description of programs via the network controller 214 or, in an alternate configuration, directly  
12 to the set top terminal 220 for display to the subscriber.

13 In the preferred embodiment, the program control information signal 276 is stored and  
14 modified by the network controller 214 and sent to the set top terminal 220 in the form of a set  
15 top terminal control information stream (STTCIS). This configuration accommodates  
16 differences in individual cable systems and possible differences in set top converter or terminal  
17 devices. The set top terminal 220 of the present invention integrates either the program control  
18 signal 276 or the STTCIS, together with data stored in the memory of the set top terminal 220,  
19 to generate on-screen menu displays for assisting the subscriber in choosing programs for  
20 viewing. (Throughout the description the term "program control information" is being used to  
21 indicate control information coming from the cable headend 208 to the set top terminal 220,  
22 whether it is sent directly from the Operations Center 202, processed by the network controller  
23 214, and then forwarded to the set top terminal as STTCIS, or transmitted over telephone  
24 lines.)

25 With further reference to TABLE A below, the types of information that can be sent  
26 via the program control signal include: number of program categories, names of program  
27 categories, what channels are assigned to a specific category (such as specialty channels),

1 names of channels, names of programs on each channel, program start times, length of  
2 programs, description of programs, menu assignment for each program, pricing, whether there  
3 is a sample video clip for advertisement for the program, and any other program, menu or  
4 product information.

5 The goal of the menu driven program selection system of the present invention,  
6 described in greater detail in U.S. Patent Application Serial No. 08/160,193, filed December  
7 2, 1993, entitled SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY  
8 SYSTEM, now U.S. Patent No. 5,734,853, owned by the assignee of the present invention  
9 and incorporated herein by reference, is to allow the subscriber to choose a program by touring  
10 through a series of menus utilizing a remote control 900 for cursor movement. The final choice  
11 in the series of menus will identify one particular channel and one time for activation of that  
12 channel. Armed with a channel and activation time the set top terminal 220 can display the  
13 selected program on the television for the viewer. To achieve this goal, an intelligent alpha-  
14 numeric code is assigned to each program. This alpha-numeric code identifies the category of  
15 the program, the menu in which the program should be displayed, its transmission time(s), and  
16 the position on the menu that the program should be displayed. In a preferred embodiment,  
17 the program control information, including menu codes, is sent continuously from the  
18 Operations Center 202 to the network controller 214, and ultimately to the set top terminal  
19 220. For example, four hours worth of programming information can be sent via the program  
20 control information signal continuously in the format shown in TABLE A.

21 TABLE A shows the basic information that is needed by the set top terminal 220. The  
22 program descriptions shown are coded abbreviations. For example, C stands for comedy, N  
23 for news, S for sports, A for cartoons, and TX for text. If there is a textual description for a  
24 program, such as a movie, the description may be given following that program's coded  
25 description or may be communicated following the four hours of programming information. As  
26 is shown in the coded listing, program descriptions for programs greater than a half hour in



length need not be repeated (each half hour). The video description code informs the set top terminal 220 whether there is still or live video available to advertise the program.

**TABLE A**

**12:00 PM**

*Program Name	*Program Length	*Menu Code	*Description	*Video
1 Cheers	.5	E24	C	N
2 Terminator	2.0	A33	Tx	S
3 PrimeTime	1.0	D14	N	N
4 Football	.5	B24	S	N
•				
•				
•				
•				

**12:30 PM**

*Program Name	*Program Length	*Menu Code	*Description	*Video
1 Simpsons	.5	E14&C13	C	S
4 Football Game	3.0	B13	S	N

For example, a sporting program may be assigned a code of B35-010194-1600-3.25-Michigan St. vs. USC. The letter B would assign the program to category B, sports. The second alpha-numeric character number 3 would assign the program to the third menu of the sports category. The third character of the code, number 5, assigns the program to the fifth program slot on the third menu. The next six characters, 01/01/94, represent the date. The following four characters, 1600 represent the start time which is followed by the length of the program and the program name. This entry represents a sports show, a college football game, which will be aired at 4:00PM on New Years day 1994.

In the 12:30 Channel 1 entry of TABLE A, two menu codes are shown. By allowing two menu codes, programs that may fit under two different category descriptions may be shown in both menus to the subscriber. With this minimal amount of information being communicated to the set top terminal 220 on a regular basis, the terminal is able to determine the proper menu location for each program and the proper time and channel to activate for the

subscriber after his menu selection. In the preferred embodiment, the menu codes are generated at the Operations Center 202.

Table B shows an example Events Table that may be downloaded to a set top terminal 220 using the Event Data file which contains information about events and pricing. As shown in the table, the three columns of the Events Table identify the field number, the field itself and the type of information downloaded in the Event Data file. The first column contains the field numbers 1 through 11. The middle column contains the corresponding field parameters, including the event type, event ID, global channel ID, price, start time, end time, start date, end date, P- icon, name and description. The third column contains corresponding field type information. As shown in this field type information typically consists of an unsigned integer; hours, minutes and seconds; months, day and year; and ASCII character identifier.

**TABLE B**

Field #	Field Type	
1	Event Type 1 = YCTV 2 = Pay-Per-View 3 = Reg. TV	Unsigned Int
2	Event ID	Unsigned Int
3	Global Channel ID	Unsigned Int
4	Price (in Cents)	Unsigned Int
5	Start Time	HH:MM:SS
6	End Time	HH:MM:SS
7	Start Date	MM/DD/YY
8	End Date	MM/DD/YY
9	P-Icon	ASCIIZ
10	Name	ASCIIZ
11	Description	ASCIIZ

Table C shows an example Event Data data file. In particular, Table C shows two data streams corresponding to two event types. The first data stream identifies a YCTV event in the first field. The second field designates the event ID, which is 1234 in this example. The third field includes the global channel ID number two. The fourth field indicates the cost of 50

cents for this event. The fifth and sixth fields indicate the respective start and end times of 3:00 a.m. to 3:00 p.m., respectively. The seventh and eighth fields show the corresponding start and end date, designated as 8/25/93 and 8/27/93, respectively. Field nine indicates the P icon set to a graphics file. Finally, fields ten and eleven indicate the name and description of the event selected, which in this case is Sesame Street<sup>TM</sup> and Barney<sup>TM</sup>. The second data stream in the Event.Dat example shown in Table C includes analogous information for Terminator IV<sup>TM</sup>, which is designated in field one as a pay-per-view event.

**TABLE C**

**Event Data Example**

1`1234`2`50`03:00:00`15:00:00`08/25/93`08/27/93`pbs.pcx`Sesame Street & Barney's Sesame Street and Barney Abstract
2`1234`2`50`20:00:00`22:00:00`08/25/93`08/25/93`t4.pcx`Terminator 4`Terminator 4 Abstract

The program control information signal 276 and STTCIS can be formatted in a variety of ways and the on-screen menus can be produced in many different ways. For instance, if the program control information signal 276 carries no menu format information, the menu format for creating the menus can be fixed in ROM at the set top terminal 220. This method allows the program control signal 276 to carry less information but has the least flexibility since the menu formats cannot be changed without physically swapping the ROM holding the menu format information. In the preferred embodiment, the menu format information is stored at the set top terminal 220 in temporary memory either in a RAM or EPROM. This configuration provides the desired flexibility in the menu format while still limiting the amount of information needed to be communicated via the program control information signal 276. New menu format information would be sent via the program control information signal 276 or the STTCIS to the set top terminals 220 each time there was a change to a menu.

In the simplest embodiment, the menus remain fixed and only the text changes. Thus, the program control information signal 276 can be limited to primarily text and a text generator can be employed in the set top terminal 220. This simple embodiment keeps the cost of the

1 set top terminal 220 low and limits the bandwidth necessary for the program control  
2 information. Another simple embodiment uses a separate channel full-time (large bandwidth)  
3 just for the menu information.

4 Figures 6a and 6b, particularly Figure 6a, show a data format 920 at the bit-level for  
5 one embodiment of a program information signal 276. This frame format consists of six fields,  
6 namely: (1) a leading flag 922 at the beginning of the message, (2) an address field 924, (3)  
7 a subscriber region designation 926, (4) a set top terminal identifier 928 that includes a polling  
8 command/response (or P/F) bit 930, (5) an information field 932, and (6) a trailing flag 934 at  
9 the end of the message.

10 The eight-bit flag sequence that appears at the beginning 922 and end 927 of a frame  
11 is used to establish and maintain synchronization. Such a sequence typically consists of a  
12 "01111110" bit-stream. The address field 924 designates a 4-bit address for a given set top  
13 terminal 220. The subscriber region designation 926 is a 4-bit field that indicates the  
14 geographical region in which the subscriber's set top terminal 220 is housed. The set top  
15 terminal identifier 928 is a 16-bit field that uniquely identifies each set top terminal 220 with a  
16 15-bit designation followed by an appended P/F bit 930. Although field size is provided by  
17 this example, a variety of sizes can be used with the present invention.

18 The P/F bit 930 is used to command a polling response 920' (Figure 6b) from the set  
19 top terminal 220 addressed. The polling response 920' is substantially similar to the from  
20 format 920, and is commonly numbered, but with a prime (') designation appended for clarity.  
21 The frame format 920 also provides a variable-length information field 932 for other data  
22 transmissions, such as information on system updates. The frame format ends with an 8-bit flag  
23 934 (or trailing flag) that is identical in format to the leading flag 922, as set forth above. Other  
24 frame formats, such as MPEG, for example, will be apparent to one skilled in the art and can  
25 be easily adapted for use with the system.

1           D.     Software Subroutines

2           The program control information signal 276 is produced substantially by the CAP CPU  
3     264 and the Delivery Control Processor Unit (DCPU) 270. An overview of the software  
4     modules, focusing on the processing of signals and communication between CAP CPU 264  
5     and DCPU 270 is shown in Figure 7. The software modules for the CAP CPU 264 and  
6     DCPU 270 include dispatcher 484, processing 486 and communications 488, each of which  
7     performs like-named functions, as well as supporting database 490 access. Processing within  
8     the CAP CPU 264 is controlled by the dispatcher 484 software module which may generate  
9     processing commands based on user command (e.g., do something now), schedule events  
10    (e.g., do something at noon) or based on the occurrence of other events (e.g., do something  
11    when the database is updated). The dispatcher 484 sends messages to the processing software  
12    module 486 instructing it to process information within the database 490 and generate control  
13    information for the DCPU 270. For example, based on the updating of information associated  
14    with a particular headend 208, the dispatcher 484 may command the CAP CPU 264 to  
15    regenerate headend 208 parameters, perform any required database integrity checking and  
16    send them to the DCPU 270. Also, in the case of headend 208 information processing, a  
17    filtering function (not shown) is performed which eliminates any information that does not either  
18    directly or indirectly relate to a given headend 208. Information transfer between the CAP  
19    CPU 264 and the DCPU 270 is controlled by the DCPU communications software module  
20    488.

21           Information received by the DCPU 270 from the CAP CPU 264 is processed at the  
22    DCPU processing module 496 and put into a form consistent with the DCPU 270. Some of  
23    this information is used for DCPU control, while most is data to be integrated into the program  
24    control information signal 261. Some of this information is also used for miscellaneous control  
25    494 for such things as external multiplex equipment, source material generation hardware,  
26    transmission equipment and so on. Information destined for the program control information  
27    signal 261 may be transmitted once or may be scheduled for periodic transmission. This

1 information is integrated by the processing module 496 with other information, both internal and  
2 external. The DCPU scheduler module 497 is responsible for scheduling and regulating this  
3 data traffic. Also, the scheduler 497 may perform information filtering. For example,  
4 imbedded date/time information within the information records of interest can be used for  
5 filtering. External pass-through control information 495 may also be incorporated into the  
6 program control information signal 261 to provide external input to this digital data stream. The  
7 DCPU multiplexer 498 is responsible for multiplexing external pass-through control information.  
8 Finally, a transmission software module 499 in conjunction with appropriate communications  
9 hardware (not shown), controls the output of both the program control information signal 261  
10 and the miscellaneous control signals 494.

11 Figure 8 is a high level diagram of CAP software subroutines and their interrelations.  
12 A Main Program (not shown) orchestrates the use of the various subroutines as needed to  
13 perform the CAP's tasks. The Packager Data Entry Interface (PDEI) 400, Marketing  
14 Information Interface (MII) 402, and Cable Franchise Information Access (CFIA) 404  
15 subroutines perform the interface functions between the CAP Main Program and outside data  
16 or information. The remaining subroutines shown in the center column of Figure 8 perform the  
17 processing and manipulations necessary to the functioning of the CAP 260.

18 The Packager Data Entry Interface (PDEI) 400 subroutine includes routines that  
19 enable the Packager to interactively enter program selections 410, start times of programs 412,  
20 price setting 414, transponder allocation 416, and menu editing 418. The PDEI subroutine 400  
21 controls the keyboard and mouse data entry by the packager and runs in concert with the  
22 processing and editing subroutines described later.

23 The Marketing Information Interface (MII) 402 subroutine interfaces the processing  
24 and editing subroutines with marketing data. This interface regularly receives programs  
25 watched information from billing sites 420, cable headends 208, or set top terminals 220. In  
26 addition, other marketing information 422 such as the demographics of viewers during certain  
27 time periods may be received by the MII 402. The MII 402 also uses algorithms 424 to

1 analyze the program watched information and marketing data 420, 422, and provides the  
2 analyzed information to the processing and editing subroutines. In the preferred embodiment,  
3 an Executive Information System (EIS) with a yield management subsystem is included in the  
4 MII subroutine as described above.

5 The Cable Franchise Information Access (CFIA) 404 subroutine receives information  
6 on cable franchises, as represented at block 426, such as the particular equipment used in a  
7 cable headend 208, the number of set top terminals 220 within a cable franchise, groupings of  
8 set top terminals 220 on concatenated cable systems 210, distribution of "high-end" cable  
9 subscribers, etc. The CFIA 404 generates a cable franchise control signal 428 which is  
10 integrated with the program control information 276 output to generate cable headend 208  
11 specific information to be transmitted. The integration algorithm for accomplishing this resides  
12 within the Generator subroutine described herein below.

13 The process program line-up subroutine 430 uses information from the MII 404 and  
14 PDEI 400 to develop a program line-up. Importance weighting algorithms and best fit time  
15 algorithms are used to assign programs in time slots.

16 The process menu configurations subroutine 432 determines appropriate menu formats  
17 to be used and positions programs on menu screens. Information from the MII 404 and PDEI  
18 400 are used to determine program positions on menus.

19 The menu display algorithms 434 displays menus as the menus would be seen by the  
20 viewer on a large CRT or color monitor.

21 The editing of menus subroutine 436 works with the menu display algorithm and PDEI  
22 400 to allow the packager to edit menus on-the-fly during viewing of the menus.

23 The graphical transponder allocation display 438 sends information obtained from the  
24 CFIA 404 and PDEI 400 to create graphical displays enabling the packager to comprehend  
25 the allocation of transponder space across the entire television delivery system 200.

26 In a manner similar to the display and editing of menus represented at blocks 434, 436,  
27 the packager may utilize the editing transponder allocation subroutine 440 to interactively

1 reallocate assignment of transponder space. In the preferred embodiment, the EIS with yield  
2 management may be used by the packager to assist in decisions on allocating transponder  
3 space.

4 The generator subroutine 442 creates the program control information signal for output.  
5 The Generator subroutine receives the cable franchise control signal and uses this signal to help  
6 create a custom signal for each cable headend 208.

7 The Packaging Routine 448 obtains and packages the programs, along with the  
8 program control information signal 216, for transmission to the transponders.

9 With continued reference to Figures 7, 8 and 9, the general software flow of the  
10 operations center 202 is depicted. The flow can be broken up into modules that apply to parts  
11 of the database to allow viewing, editing, and adding records to the database. The software  
12 also accomplishes database integrity checking by restricting the user to enter only valid data,  
13 and by checking for conflicts.

14 Figure 9 shows some of the software involved in the creation of programs, events and  
15 services. This creation occurs prior to or during the processing of the program line-up 430  
16 shown in Figure 8. With reference to Figure 9, a first step is indicated generally at 461 and  
17 includes acquiring source materials for program production at the Operations Center 202 (e.g.,  
18 tape production). Once the source materials are collected 460, and entered into the database  
19 "D", they can be used to create programs 462. These programs are made up of source "cuts"  
20 from various video/audio source materials. Once the programs have been generated and  
21 entered into the database "D", events, collections of one or more programs, are created 464.  
22 Each event is then schedule onto a service 466, with the software checking for conflicts. Each  
23 service is given run times, and days, and checked for conflicts. Once the services and events  
24 have been created, the event names can be added to the menus 468. The programs for the  
25 events and services may be stored at the Operations Center (as shown in Figure 11 at 286).  
26 Processing and manipulation of the events or records is depicted generally at 463.



1           The packager user interface (a portion of 463) for each of the creation modules works  
2 substantially identically to each of the other modules to make the interface easy to use and  
3 learn. The packager user interfaces forms a portion of the PDEI 400 shown on Figure 8. The  
4 browse system 470 is entered first and allows viewing of records, and selection of specific  
5 records. The database can be 'populated' by selection of a button, which activates a populate  
6 screen. As represented at block 471, this allows details to be deleted, added or changed for  
7 events, programs, and sources. The browse screen also allows access to the edit screen 472,  
8 where fields in a selected record can be modified, with conflicts or errors, in scheduling for  
9 example, being checked continuously, as at 473 and 474.

10           In use, the Operations Center 202 of the present invention performs a variety of  
11 management functions which can be broken out into five primary areas: (1) cable headend 208  
12 management, (2) program source management, (3) broadcast program management, (4)  
13 internal program storage and management, and (5) marketing, management and customer  
14 information. A relational database, such as that represented by Figure 10, can be used to  
15 maintain the data associated with these areas.

16           Customer billing is not included in any of the above five areas for the Operations Center  
17 202. Although billing can be handled by the Operations Center 202 (as shown in the database  
18 structure 508, 511), it is preferred that billing is handled at a remote location through traditional  
19 channels and methods (such as Cable TV billing provided by Telecorp corporation). Extracts  
20 of customer purchases will be provided to the Operations Center 202. These extracts of  
21 information will be formatted and correlated with customer demographics for marketing  
22 purposes by the Marketing Information Interface (MII) 402.

23           (1)     Cable Headend Management

24           Management of the cable headend 208 includes the following activities: defining the  
25 cable headend site; profiling the viewers; determining available set top equipment; defining the  
26 concatenated cable systems connected to the cable headend site. This information may be  
27 stored as cable franchise information within the Operations Center 202 database by the Cable

Franchise Information Access routine 404. Such information can be compiled and maintained in a relational database (described below and shown as 328 in Figure 11).

## (2) Program Source Management

Source programs will be provided by a variety of networks. Information from the contractual records to the actual program tapes should be maintained and includes: tracking of property rights; tracking and profiling source tapes; profiling source providers. A relational database (such as "D" shown in Figure 9) can be used, for example, that identifies and correlates programs sources. Programs may be received from various rights holders, and such a database would track the person or entity that owns the rights to each program at issue. Other data could be maintained relating to program cuts (a program cut is a portion of a program) that specifies, for example, the program from which the cut is taken. Information relating to time slot allocations, menu entries, and categories, and channel assignments are also maintained in the relational database.

Program services represents a purchasable time slice which is occupied by a type of programming. Each time slice has multiple time constraints. Using the purchasing of through time slices allows for great flexibility. An infinite number of program and time slice combinations are possible. Preferably, services are created using the software shown in Figure 9, particularly the service creation routine 466. For a service to become available at a cable headend 208 site, it is mapped to the site. At the time of mapping the program service is assigned a program channel.

Program services are defined by the following fields:

Service ID	System generated unique ID
Description	Describes the service. The description will allow the packager to easily assign a service to a broadcast program.
Type	Defines the type of service. Current service types include YCTV™, Grid, Network and Other.
Network ID	Relevant for network services. (examples: ABC, NBC, DISC™)

1	Broadcast Event	Relevant for a YCTV™ service. Identifies the current YCTV™
2		broadcast event assigned to the service.
3	PICON File	Name of the picture icon (PICON) assigned to the service. This
4		picon is displayed for example on the buy screen for a pay per
5		view event.
6	Expiration Date	Expiration date of the service. Removes the service from the
7		service selection list.
8	Day Start	Each service is a series of days within a week. This represents the
9		starting day (example: Monday).
10	Day Stop	Represents the last day in the interval.
11	Time Start	Within a day, the service has a time period. This field represents
12		the start of the period.
13	Time Stop	Represents the end of the time period.
14	Required Tape	If stored tapes are required, the number of tapes required by the
15		service.

### (3) Broadcast Program Management

Broadcast program management is one focal point of the data management system. The issues of product, price, promotion and packaging are addressed at this level. Decisions in these areas will affect the actual programming that will be shown to the viewers. Information on description of the content of each program event, program scheduling, broadcast program pricing, TV/set top information flow and information on how broadcast programs will be mapped to viewer channels should be included in the database. Preferably, the EIS system described below will access this data and assist in the Broadcast Program Management.

### (4) Internal Program Management

Information on internally stored programs at the Operations Center 202 should also be maintained. This will allow the Operations Center 202 to assemble electronically stored

1 programs, CD stored programs and program tapes, and ensure the quality of programs and  
2 location of programs.

### 3 (5) Marketing And Customer Information

4 Last, and important, marketing and customer information should be maintained. In  
5 order to effectively manage the operations, information is constantly needed on market  
6 conditions. Information is needed on the existence of markets for certain programs. The  
7 following type of information must be maintained in a Marketing and Customer Information data  
8 base: demographic profile of viewers, viewer buy information; correlation of demographic  
9 information with buy information, information rapid restructuring of program mix in response  
10 to data analysis. As a subscriber uses the system, this viewer information or viewer log data  
11 can be stored and maintained in relational database. The Marketing Information Interface 402  
12 gathers the marketing information and indexes the information for inclusion in the Marketing and  
13 Customer Information database. An example of the type of information that is needed in this  
14 data base is a viewer profile.

15 The viewer profile data fields are an example of typical fields required in the databases.  
16 Definitions of various fields are listed below. The primary purpose of profiling the viewer is to  
17 acquire marketing information on the viewer's response to available selections. Ancillary  
18 information will be available including the actual program and channel selections of the viewer.  
19 Information tracked within the viewer's profile includes:

20	Viewer ID	A unique identifier generated by the system.
21	Set-Top Types	Boolean field which identifies the type of set top used.
22	Headend ID	Links the viewer to a particular cable site.
23	Site Assigned ID	Viewer ID assigned by the cable site.
24	Set-Top ID	ID of the viewer's set top.
25	Hookup Date	Date physical hardware is connected.
26	Survey Date	A demographic profile will be conducted on each user.
27		The following fields represent this demographic

information. The data represents when the interview survey was completed.

Viewers Age 2-5 Boolean field if the household has viewers between 2 and 5 years of age.

Viewers Age 6-11 Boolean field if the household has viewers between 6 and 11 years of age.

Viewers Age 12-17 Boolean field if the household has viewers between 12 and 17 years of age.

Tape Rental \$ Approximate amount spent on tape rentals on a monthly basis.

PPV \$ Household average pay-pre-view expenditures per month.

Income Annual household income.

Zip Code Self-explanatory.

Cable Tier Level of cable service purchased.

Number of TV's Self-Explanatory.

Years with Cable Self-Explanatory.

Occupancy Number of people in household.

Highest Education Highest level of education of any member of the household.

The compilation of viewer demographic information has an impact on decisions based on marketing. The names of the heads of household are not used due to Privacy Act considerations. Completion of demographic data can be accomplished referencing the cable site assigned ID or the system generated ID. There are numerous variations to the field definitions listed above such as different age groupings.

To maintain the database at the Operations Center 202, a data base server, communications server, user work station or stations 262, or the suitable equivalent thereof,

1 are needed. The database server performs the following functions: it is the repository for data  
2 base files, event logging, event scheduling (example, automated download of files to headends  
3 208), multi-user services, data base server services, and data base security access.

4 The communications server performs the following functions on data base data:  
5 integrity check, filtering, processing, downloading to headends 208, uploading from headends  
6 208, and uploading from remote location.

7 User work stations 262 perform the following tasks: creation, deletion and access of  
8 all database data, system administration and report generation. Database manipulations are  
9 performed through the user workstations or remotely. The database structure is designed to  
10 support multiple users performing multiple tasks simultaneously. The preferred embodiment  
11 includes a network of user workstations 262. The workstations 262, through user interface  
12 software, access data within database files on the database server.

13 For example, once the appropriate database data has been generated for downloading  
14 to a cable headend 208, the communications server is instructed to perform the download.  
15 Although this may be done manually at the communications server, it is preferred that the  
16 communications server automatically send information to the cable headends 208. The  
17 communications server retrieves required data from the database server, filters out any data not  
18 associated with the specified headend 208, and performs data integrity checks, creates data  
19 files to be downloaded and then downloads the data file via modem (or other devices such as  
20 the DCPU 270). While the communication server is connected with the headend 208, it also  
21 requests any data that the headend might be holding for the Operations Center 202. This may  
22 consist of cable headend 208 event log information, set top billing and viewer log data on  
23 programs watched, etc.

24 The communications server may also assist in retrieving information from other remote  
25 sites such as remote billing and statistic sites. For example, if a location is being used for billing  
26 purposes, the communications server may retrieve viewer log data. Also, the communications  
27 server may retrieve billing and viewer log data from actual set top converters in the field. Once

1 the data is retrieved it is sent to the database server. Thus, in the preferred embodiment the  
2 communications server will support incoming information via modem or otherwise.

3 The basic database structure at the Operations Center 202 consists of multiple tables.  
4 Database data tables contain one or more data records, each with multiple fields. Each field  
5 contains a piece of data about the particular record. This data may be general information,  
6 such as a numeric value, date or text string, or it may be a reference to another database record  
7 relating one piece of data to another. Database index files contain information about associated  
8 data files to allow for improved data retrieval. The database index file makes retrieval of  
9 information much quicker.

10 In an alternative embodiment where some television programming begins with the  
11 procurement of source material in the form of tapes or CDs, additional data about the tapes or  
12 CDs may be stored in the Operations Center database. Each tape or CD may have a database  
13 record associated with it, source tape data file. Each tape may contain multiple cuts of which  
14 each cut has an associated record in a source tape detailed data file. Additionally, a company  
15 data file may contain individual records for the rights of the holders of the source tapes as well  
16 as company information about cable headends 208. In this alternative embodiment with tapes,  
17 programs may be created from multiple tapes using multiple tape source cuts. The programs  
18 created by these source cuts may be stored and the individual cuts that make up the programs  
19 may be stored in a database record called "program tape detail." Events may be created that  
20 consist of more than one program and details on individual programs that make up these events  
21 may be stored in a database file called "event detail." Using this embodiment, events may be  
22 sold to subscribers.

23 Figure 10 and the description below is a more complete example of a database  
24 structure that can be used with the present invention. Each database file is listed below along  
25 with a description, record field details and explanation of relationships. The software data  
26 structures are defined after the description of the database structure.

1           The SCHEDULE Database file 501 contains scheduling data for a single day. There  
2           are many schedule files, one for each day of schedule information. The actual filename for a  
3           given days schedule is assigned under computer control. Schedules are broken up into single  
4           days so they may be easily created, dispatched and archived. A cross-reference of days to  
5           computer generated filenames is kept. Each scheduled event (either a program or a preview)  
6           has its own record entry and unique schedule ID. This record references the corresponding  
7           scheduled program or preview and program type (either program or preview). The service to  
8           carry the scheduled program is also referenced. The starting date and time is also specified.  
9           Program duration is stored as a program attribute and is not included here. Note that program,  
10          preview and service records must be provisioned before they may be referenced in a schedule  
11          record.

12          Another SCHEDULE Database file 500 contains a cross-reference of starting dates  
13          data to computer generated filenames.

14          The PROGRAM Database file 502 contains Program records are contained in another  
15          database file 502, with each record representing a source program. Each program has a  
16          unique program ID. If the program has a corresponding preview, it is also referenced.  
17          Program category and price are also referenced. The structure of the program category  
18          database may be modified if multiple categories per program are desired. Program name,  
19          description and duration are also given. Note that preview, program category and price  
20          category records must be provisioned before they may be referenced in a program record.

21          The SERVICE Database file 503 contains service records with each record  
22          representing an available service. A service may be thought of as a virtual video channel.  
23          Virtual channels are non-existent channels which are mapped or created by hardware and  
24          software and is described in U.S. Patent Application Ser. No. 08/160,194, filed December 2,  
25          1993, entitled ADVANCED SET TOP TERMINAL FOR A CABLE TELEVISION  
26          DELIVERY SYSTEM, now U.S. Patent No. 5,990,927, incorporated herein by reference.  
27          Services are then mapped into local headend channels. Since initial distribution of video source



1 material may be by "Federal Express" instead of a video channel, a service ID is used to  
2 identify the virtual channel being used for the desired service. "60 Minutes" could be  
3 distributed and then be mapped into any desired local headend channel. The service database  
4 exists at both the national site and at each local headend 208. Every service has a name, call  
5 letters and a description of the service. Every service also has an assigned local channel, "A"  
6 tape (or CD) machine ID and "B" tape (or CD) machine ID. Note that these last three  
7 parameters only apply to the service databases at the local headends 208. The local headend  
8 service database performs an equivalent function of a "channel map." For a further description  
9 of the cable headend function, see U.S. Patent Application Ser. No.08/160,280, filed  
10 December 2, 1993, entitled NETWORK CONTROLLER FOR A CABLE TELEVISION  
11 DELIVERY SYSTEM, now U.S. Patent No. 5,600,364.

12 The PREVIEW Database file 504 contains preview records with each record  
13 representing a source preview. A preview is like a program that is scheduled and distributed  
14 over a service. It differs from a program in that multiple previews may be distributed over the  
15 same service at the same time. Also, previews are free. Each preview specifies its location on  
16 the TV screen. This is generally done by selecting from a menu of valid screen positions.  
17 Unlike programs, previews do not reference program and price categories or other previews.

18 The PROGRAM CATEGORY Database file 505 contains program category records  
19 with each record representing a valid program category. Examples of program categories are  
20 movies, sports, educational and news. Multiple program categories per program may be  
21 accommodated if desired with simple changes to the database structure.

22 The PRICE CATEGORY Database file 506 contains price category records with each  
23 record representing a valid price category. Price categories are used to provide pricing  
24 consistency throughout the system. It also provides flexibility at the headend 208 to price  
25 various categories differently should this be desired. For example, distributed movies may be  
26 assigned the price category "movie" at the national site. Each headend 208 could then charge  
27 differing amounts for their movies by manipulating their local price category database. If a

1 current price structure needed to be changed, the change would be made once in the price  
2 category database instead of in each program record.

3 The EVENT LOG Database file 510 contains event data for a single day. There are  
4 many event files, one for each day of event information. The actual filename for a given days  
5 events is assigned under computer control. Events are broken up into single days so they may  
6 be easily archived. A cross-reference of days to computer generated filenames is kept.

7 Each event record contains a unique ID, an event code, ID of the process that  
8 generated the event and date/time stamp of the event.

9 The EVENT LOG FILENAME Database file 507 contains a cross-reference of start  
10 date to computer generated filenames.

11 The VIEWER LOG Database file 512 contains viewer log data for a single day. There  
12 are many viewer log files, one for each day of viewer log information. The actual filename for  
13 a given days viewer log data is assigned under computer control. Viewer log data is broken  
14 up into single days so it may be easily archived. A cross-reference of days to computer  
15 generated filenames is kept.

16 Each event record contains a unique ID, an event code, ID of the process that  
17 generated the event and date/time stamp of the event. The Marketing Information Interface  
18 402 accesses the VIEWER LOG Database file as necessary to retrieve "program watched"  
19 information 420.

20 The VIEWER LOG FILENAME Database file 509 contains a cross-reference of date  
21 to computer generated filenames.

22 The BILLING Database file 511 contains billing data for a single day. There are many  
23 billing files, one for each day of billing information. The actual filename for a given days billing  
24 data is assigned under computer control. Billing data is broken up into single days so it may  
25 be easily archived. A cross-reference of days to computer generated filenames is kept.

26 Each event record contains a unique ID, an event code, ID of the process that  
27 generated the event and date/time stamp of the event.

1           The BILLING FILENAME Database file 508 contains a cross-reference of start date  
2 to computer generated filenames.

3           The NEWS FILENAME Database file 509 contains a cross-reference of date to  
4 computer generated filenames.

5           The SET TOP Database file 517 contains set top converter records with each record  
6 representing a unique set top converter. Each set top is assigned to a headend 208. Set-top  
7 type, software version and serial number is also stored. Note that headend records must be  
8 provisioned before they may be referenced in a set top record.

9           The HEAD END Database file 518 contains headend records with each record  
10 containing headend 208 data specific to a single headend 208. Each headend 208 has a name,  
11 contact name, address, phone number, modem information, time zone (relative to GMT) and  
12 daylight savings time flag. This information may be stored in a separate database file called  
13 Cable Franchise Configuration (shown as 328 in Figure 11).

14           The NATIONAL Database file 515 contains a single record containing national site  
15 information. This includes site name, contact, modem information, time zone and daylight  
16 savings time flag.

17           The CUSTOMER Database file 516 contains customer records with each record  
18 containing customer data specific to a single customer. This includes personal information  
19 (name, address, phone number, . . .) and assigned set top converter.

20           The TAPE MACHINE Database file 519 contains video tape or CD machine  
21 information. Each machine is assigned a unique ID, its control port address, it's a/B switch  
22 address (if present), its assigned service and an A/B assignment. This database is only located  
23 at the headends 208.

24           The MESSAGE Database file 514 contains available system messages. They are  
25 detailed in nature and are pre-programmed. Each message has an associated function. To  
26 schedule a desired function, the appropriate message is referenced in the scheduler task list.

1           The TASK Database file 513 contains scheduled tasks to be performed periodically.  
2           It is used in conjunction with a scheduler process to control computer system functions such  
3           as data dispatch and retrieval, archival and database maintenance. Each task is assigned a  
4           unique ID, start time, stop time, period in minutes) and task type (single, periodic, round-robin).  
5           Functions are actually scheduled by scheduling the appropriate message to be sent to the  
6           appropriate process. Available messages are kept in a separate database. Note that these  
7           messages must be provisioned before they may be referenced in a task record.

8           E.     System Operations

9           Figure 11 shows the basic operations that must occur in order for the packaged signal  
10          to be sent to the satellite 206. External digital 280 and analog signals 282 must be received  
11          from television programming sources and converted to a standard digital format by a converter  
12          284, as described above. Also within the Operations Center 202, stored programs 286 must  
13          be accessed using banks of looping tape machines or other video storage/retrieval devices,  
14          either analog or digital, and converted to a standard digital format by the converter 284 prior  
15          to use by the CAP 260.

16          The programmer or program packager utilizing the CAP 260 must input a variety of  
17          information, including program information, in order to allow the CAP 260 to perform its  
18          function of generating program control information and packaging programs. Some of the  
19          information required by the CAP 260 are the date, time slots and program categories desired  
20          by the television programmer.

21          The CAP 260 system includes one or more CPUs and one or more  
22          programmer/packager consoles, together identified in Figure 4 as workstations 262. In the  
23          preferred embodiment, each packager console includes one or more CRT screens, a  
24          keyboard, a mouse (or cursor movement), and standard video editing equipment. In large  
25          Operations Centers 202, multiple packager consoles 262 may be needed for the CAP 260.

26          As shown in Figure 12, the first step in the operation of the CAP 260 is selecting the  
27          type of programming 300 which will be packaged. Basically there are six broad categories

1 in which most television programming can be classified: static programming 302, interactive  
2 services 304, pay per view 306, live sports specials 308, mini pays 310, and data services  
3 312. Static programs are programs which will show repetitively over a period of time such  
4 as a day or week. Static programs include movies showing repetitively on movie channels,  
5 children's programs, documentaries, news, entertainment. Program services, with defined  
6 start and end time periods, behave like static programs and may be handled in a similar  
7 manner.

8 Interactive services 304 typically include interactive programs using the Vertical  
9 Blanking Interval (VBI) or other data streams synchronized with the programming to  
10 communicate interactive features (such as those used in education), and games. Using this  
11 feature, interactive home shopping programs are possible. Pay per view 306 are programs  
12 which are individually ordered by the subscriber. After ordering, the subscriber is authorized  
13 to access the program for a limited time, (e.g. three hours, two days, etc.). Live sports specials  
14 are live events usually related to sports which subscribers are unlikely to watch on taped delay.

15 Mini pays 310 are channels to which existing set top converter boxes (not shown) and  
16 the set top terminals 220 of the present invention may subscribe. The subscriptions for mini  
17 pays 310 may be daily, weekly, or monthly. An example would be the Science Fiction  
18 channel. Data services 312 are services in which information is interactively presented to the  
19 subscriber using a modem or other high rate of speed data transfer. Some examples are  
20 Prodigy, services for airline reservations, and TV guide services (e.g. TV Guide X\*PRESS™,  
21 InSight™, etc.). Data could also include classified or other forms of advertising.

22 The packager begins the CAP processing using the Packager Data Entry Interface  
23 Software 400 and a workstation 262. After selecting the type of programming, the packager  
24 must identify a pool of programs (within a category) to be packaged. The next CAP step  
25 varies for different program categories. For the category of live sports 308, additional program  
26 interstitial elements 314 such as promos and other sports news may be added before further  
27 processing. For the live sports 308, static (or program service) 302, interactive services 304

1 and pay per view 306 categories, the next CAP 260 step is for one television program to be  
2 selected 316. This is followed by each program individually being assigned dates to be played,  
3 a start date (for continuous play) and start times 318. Many dates and start times may be  
4 assigned to any given program. Using this methodology, programs may be purchased by  
5 viewers in time slices (e.g., one week). The program information for these categories may then  
6 be processed for allocation of transponder space and setting of prices, as indicated at blocks  
7 320, 322, respectively.

8 Mini pays 310 and data services 312 require less processing by the CAP 260. After  
9 identifying the mini pays 310, the CAP 260 may proceed to allocation of transponder space  
10 and pricing, block 320, for the mini pays 310. Data services in the preferred embodiment  
11 generally do not require allocation of transponder space and generally do not require price  
12 setting. The information for data services 312 may be directly processed for menu  
13 configuration, block 324. In alternate embodiments, the data services 312 may be processed  
14 through these portions of the CAP 260 program.

15 The CAP 260 uses an interactive algorithm 416 to allocate transponder space 320 and  
16 set prices 322. The factors weighed by the algorithm are: 1. buy rates of the program, 2.  
17 margin of profit on the program, 3. length of the program, 4. any contractual requirement which  
18 overrides other factors (such as requirement to run a specific football game live in its entirety).  
19 The information on buy rates of the program may be obtained by the Marketing Information  
20 Interface 400 from a Central Statistical and Billing Site, a Regional Statistical and Billing Site,  
21 the cable headend 208 or directly from the set top terminals 220 as will be described later.  
22 The CAP 260 must consider the priority levels of programming (e.g., Figure 16) when  
23 allocating transponder space. Particularly, as in the preferred embodiment, transponders are  
24 assigned to three specific priority levels. The CAP may automatically (without packager  
25 intervention) access the MII 400 and the EIS to obtain necessary decision making information  
26 on transponder allocation.

1           Following transponder allocation and price setting 320, 322, respectively, the CAP  
2           260 proceeds to menu configuration 324. The positioning of programs within the menu  
3           configuration 324 can have an effect on subscriber buy rates for the program. (The processing  
4           of menu configurations 432 is also described in reference to Figure 8.) Therefore, an algorithm  
5           accounting for either a manually assigned program importance or a calculated weight of the  
6           program importance is used to determine each programs position within the menu scheme. For  
7           instance, a popular program with a high profit margin may be assigned a high weight of  
8           importance and shown in a prominent place in the menu scheme. Alternatively, a high profit  
9           program with sagging sales may be manually assigned a prominent place in the program  
10          schedule to increase sales.

11          After a series of entries by the programmer/packager at the Operations Center 202,  
12          the CAP 260 displays draft menus 434 or schedules (including priority levels) for programming.  
13          The packager may now manipulate the menus and schedules and make changes as necessary  
14          436. After each change, the packager may again display the menus or schedules and determine  
15          if any more changes are necessary 436. The packager may use the Executive Information  
16          System with yield management as described below to assist in editing the menus and schedules.  
17          When the packager is satisfied with the menu configuration 324 and scheduling of television  
18          programs, the packager may then instruct the CAP 260 to complete the process.

19          After menu configuration 324, the CAP 260 may begin the process of generating a  
20          program control information signal 326 (see also Figure 8 software description at 442 and  
21          404). In order to generate program control information signals 326 which are specific to a  
22          particular cable headend 208 system, the CAP 260 incorporates cable franchise configuration  
23          information 328. In the preferred embodiment, unique cable franchise configuration information  
24          328 is stored at the Operations Center 202. The cable franchises upload changes to their  
25          specific franchise information 426 from time to time to the Operations Center 202 for storage  
26          328. Preferably, a separate CPU (not shown) handles the management of the cable franchise

1 information 328. From the stored cable franchise information 328, the CAP 260 generates a  
2 cable franchise control information signal 330 unique to each franchise.

3 Using the unique cable franchise control information signals 328 and the menu  
4 configuration 324 information, the CAP 260 generates the program control information signal  
5 276, as shown at function block 326. The program control information that is unique to a  
6 particular cable franchise may be identified in various ways such as with a header. With the  
7 header identification, the cable headend 208 may extract the portions of the program control  
8 information signal 276 it needs. Now, the CAP 260 may complete its process by electronically  
9 packaging the programs into groupings 280 for the signal transmission and adding the program  
10 control information 276 to the packaged programs 334 to form a single signal for transmission.  
11 Through manual entries by the packager (PDEI 400) or by comparing against a list of  
12 programs, the CAP 260 will determine whether the programs are arriving from external sources  
13 280 or sources internal 286 to the Operations Center 202.

14 Referring back to Figure 11, upon completion of the CAP's functions, the Operations  
15 Center 202, or the uplink site 204 (Figure 1), compresses 288 (if necessary), multiplexes 290,  
16 modulates 292 and amplifies 294 the signal for satellite transmission 296. In a basic  
17 embodiment, the CAP 260 will also allow entry of time slots for local avails where no national  
18 programming will occur.

19 Figure 13 is a more detailed flow chart 340 of some of the functions performed by the  
20 CAP 260 after an initial program schedule has been entered and menu configurations  
21 generated. This flow chart highlights that some of the functions described earlier in reference  
22 to Figures 8, 9, 11 and 12 can be performed in parallel. The flow chart 340 shows six basic  
23 functions that are performed by the CAP 260: (1) editing program schedule for local  
24 availability 342 (only for non-standard services, i.e., those services that are not national cable  
25 services); (2) generating program control information signals 344; (3) processing external  
26 programs 346; (4) processing internal programs 348; (5) processing live feeds 350; and, (6)  
27 packaging of program information 352. In an alternate embodiment, the CAP 260 is capable



1 of incorporating local programs and accommodating local availability for local television  
2 stations.

3 Following completion of the programming scheduling (accounting for local availability  
4 if necessary) and menu generation 342, the CAP 260 may perform three tasks simultaneously,  
5 generating program information signals 344, processing external programs 346 and processing  
6 internal programs 348.

7 The CAP 260 automatically identifies external programs feeds 356 and identifies which  
8 external feed to request the external program 358. The CAP 260 gathers and receives the  
9 external programming information 280, 282 (Figure 11) and converts it to a standard digital  
10 format 360 for use. The CAP 260 also identifies internal programs 362 (and defined program  
11 services), accesses the internal programs 364 (and program services), and converts them to  
12 a standard digital format 366, if necessary. In addition, the CAP 260 identifies live signal feeds  
13 368 that will be necessary to complete the packaged programming signal 370. In its last task  
14 depicted in Figure 13 the CAP 260 completes the packaging of the programs and combines  
15 the packaged program signal with the program control information signal 352, amplifies the  
16 signal 354 and sends it out for further processing prior to uplink.

#### 17 E.1. Menu Structure

18 The series of menus shown in Figure 22 is the normal or standard format for a variety  
19 of alternative embodiments to the present invention. An introductory screen upon power up  
20 that contains important messages, followed by a home menu 1010 with major programming  
21 categories is the basis upon which many alternative embodiments of the menu driven selection  
22 process can be built.

23 Skipping a sequence or level of the menu structure is possible and perhaps desired in  
24 certain instances. In simple alternate embodiments it is possible to combine the home menu  
25 1010 and introductory menu 1000 into one menu that performs both functions. It will be  
26 obvious to one skilled in the art that the specific functions of the Home menu 1010 and  
27 Introductory menu 1000 may be exchanged or shared in a number of ways. It is also possible

1 to allow a user to skip directly from the introductory menu 1000 to a submenu 1050. This can  
2 be accomplished most easily with a separate direct access remote control 900 button.  
3 Generally, a subscriber will access a television program through execution of a submenu 1050.

4 The During program menus 1200 are enacted by the set top terminal 220 only after  
5 the subscriber has selected a television program. These menus provide the subscriber with  
6 additional functionality and/or additional information while he is viewing a selected program.  
7 The During program menus 1200 sequence can be further subdivided into at least two types  
8 of menus, Hidden Menus 1380 and Program Overlay Menus 1390.

9 To avoid disturbing a subscriber during viewing of a program, the Hidden Menus 1380  
10 are not shown to the subscriber but instead "reside" at the set top terminal 220 microprocessor.  
11 The Hidden Menus 1380 do not effect the selected program audio. The microprocessor  
12 awaits a button entry either from the remote 900 or set top terminal 220 buttons before  
13 executing or displaying any Hidden Menu options. The Hidden Menus 1380 provide the  
14 subscriber with additional functions such as entering an interactive mode or escaping from a  
15 selected program.

16 Program Overlay Menus 1390 are similar to Hidden Menus 1380 in that they occur  
17 during a program. However, the Program Overlay Menus 1390 are overlaid onto portions  
18 of the television screen and not hidden. The Program Overlay Menus 1390 allow the  
19 subscriber to continue to watch the selected television program with audio but place additional  
20 information on portions of the television screen. Most overlays cover small portions of the  
21 screen allowing the subscriber to continue to comfortably view his program selection. Other  
22 Overlays which are by their nature more important than the program being viewed will overlay  
23 onto greater portions of the screen. In the preferred embodiment, some Program Overlay  
24 Menus 1390 reduce or scale down the entire programs video screen and redirect the video to  
25 a portion of the screen.

26 All menu entries may be made either from buttons available on the top cover of the set  
27 top terminal 220 or from the remote 900.

1           Figure 23a shows the preferred embodiment for subscriber selection of television  
2 programming. Figure 23b shows additional major menu 1020 categories, 1042, 1044, 1046,  
3 1048, which may used with the invention. Again, the introductory menu 1000 followed by the  
4 home menu 1010 is the preferred sequence of on-screen displays. In the preferred  
5 embodiment shown in 23a, the home menu 1010 provides a choice of ten major menus 1022,  
6 1024, 1026, 1028, 1030, 1032, 1034, 1036, 1038, 1040. Upon selection of a major menu  
7 1020 category from the home menu 1010, the program proceeds to a major menu 1020  
8 offering further viewer selections. Each major menu 1020 is customized to target the expected  
9 viewership. Depending on the number of available program choices the major menus 1020  
10 either breakdown the major category into sub-categories or provide the subscriber with access  
11 to further information on a particular program.

12           For example, the major menu 1020 for children's programming provides a list of  
13 subcategories 1052 from which the subscriber selects. Upon selection of a subcategory a  
14 submenu 1054, 1056 listing program choices within that sub-category is shown to the  
15 subscriber. Upon selection of a particular programming choice within the first submenu 1050,  
16 the subscriber is then provided with a second submenu 1058 describing the program that the  
17 subscriber has selected. From this menu, the subscriber may now confirm his program choice  
18 and receive a confirmation submenu 1060 from the set top terminal 220 software.

19           Since the system utilizes digital signals in compressed format, High Definition Television  
20 programming can also be accommodated through the menu system. In addition, since the set  
21 top terminal 220 has two way communication with the cable headend, interactive television  
22 programming is possible, with return signals generated by the set top terminal 220. Similarly,  
23 the system can support "movies on demand" where a subscriber communicates through the set  
24 top terminal 220 with an automated facility to order movies stored at the facility.

25           Using this on-screen menu approach to program selection, there is nearly an unlimited  
26 number of menus that can be shown to the subscriber. The memory capability of the set top  
27 terminal 220 and the quantity of information that is sent via the program control information

1 signal are the only limits on the number of menus and amount of information that can be  
2 displayed to the subscriber. The approach of using a series of menus in a simple tree sequence  
3 is both easy for the subscriber to use and simply implemented by the set top terminal 220 and  
4 remote control device 900 with cursor movement. A user interface software programmer will  
5 find many obvious variations from the preferred embodiment shown.

6 Figures 24a and 24b show examples of introductory menu screens that are displayed  
7 on the subscriber's television. Figure 24a, the preferred embodiment, welcomes the subscriber  
8 to the cable system and offers the subscriber three options. The subscriber may choose regular  
9 cable television (channels 2 through 39), programs on demand (e.g., movies), or instructions  
10 on the use of the remote control 900. Other basic program options are possible on the  
11 introductory menu screen 1000. For example, instead of, or in addition to, the remote control  
12 900 instructions, a system "help" feature can be offered on the introductory menu 1000.

13 Fig 24b shows an alternate embodiment for the introductory menu screen 1000. In the  
14 upper left-hand corner of the menu, there is a small window 1002 that may be customized to  
15 the subscriber. A subscriber will be given the option of showing the current time in this  
16 window. In the upper right-hand corner a second customized window 1004 is available in  
17 which a subscriber may show the day and date. These windows may be easily customized for  
18 subscribers to show military time, European date, phase of the moon, quote of the day, or other  
19 informational messages. These windows may be customized by subscribers using on-screen  
20 menu displays following the introductory menu 1000.

21 In the preferred embodiment, the subscriber is given the capability of accessing base  
22 channels such as regular broadcast TV and standard cable channels directly from the  
23 introductory menu 1000 by entering the channel number. The subscriber is also given the  
24 capability of directly accessing his account with the cable company. Further, in the preferred  
25 embodiment, the subscriber may directly access a major menu 1020 and bypass the home  
26 menu screen 1010. If the subscriber is familiar with the programming choices available on the  
27 major menus 1020, he may select an icon button 960, or a lettered key (alpha key) from his

1 remote control 900 and directly access the desired major menu 1020. If any key entry other  
2 than those expected by the set top terminal 220 software program is made, the home menu  
3 1010 is placed on the television screen. In addition, after a period of time if no selections are  
4 made from the introductory menu 1000, the program may default to the home menu screen  
5 1010.

6 Figures 25a, 25b, 25c, and 25d are examples of home menus 1010 that may be used  
7 in the set top terminal 220 software. Figures 25a-25d all employ multiple window techniques  
8 to make the menu user friendly and offer a significant number of choices. It is preferred that  
9 a channel line up and the major menu 1020 categories both appear on the home menu 1010.

10 Figure 25a, the preferred home menu 1010 embodiment, displays both the standard  
11 channel line up and the programming on demand icons for selection by the subscriber. Figure  
12 25a also shows various levels of subscription programming, including a "Basic" cable package  
13 and a "Basic Plus" package. Each of the choices of subscription programming preferably is  
14 assigned a different color. This increases the user friendliness of the present invention.

15 In Figures 25b-25d, the left half of the screen is used to list the channel number and  
16 network abbreviation of the most popularly watched networks. The right half of the screen  
17 offers access to a variety of major menus 1020 listed by category names.

18 Figure 25b shows an embodiment in which only eight major menus 1020 are utilized.  
19 By pressing the alpha-numeric or icon key 960 corresponding to the category of programs the  
20 subscriber desires, the appropriate major menu 1020 is accessed. In addition, the subscriber  
21 may employ an on-screen cursor to select any option shown in the menu. To move the cursor,  
22 the subscriber may use either the cursor movement keys on the remote control 900 or similar  
23 keys located at the top of the set top terminal 220.

24 Figure 25c shows how additional major menus 1020 can be displayed on the home  
25 menu screen 1010. When there is no longer room available for additional major menu 1020  
26 choices on the home screen, the subscriber may access a second screen of the home menu  
27 1010. For example, in Figure 25c, if additional major menus 1020 "J" through "Z" existed, the

1 subscriber would access those menus by highlighting and selecting the J through Z menu  
2 option(or press the J-Z on his remote 900). After selecting J through Z, the second or  
3 extended home menu screen 1010 would appear on a subscriber's television set. This menu  
4 would then list options J through Z separately by name. Theoretically, the home menu 1010  
5 may have many extended home menu screens. However, any more than a few extended home  
6 menu screens would confuse the average subscriber.

7 The home menu 1010 of Figure 25d adds an additional feature at the bottom of the  
8 television screen 1011. This option allows a subscriber to see only those program selections  
9 that are available on broadcast television. Figures 25a-d are but a few of the numerous  
10 variations available for the home menu 1010.

11 Additionally, as shown in Figure 26, in an alternate embodiment, the home menu 1010  
12 (or menu which would normally follow the introductory menu 1000) can be simply the standard  
13 cable channel line-up. Offering the standard cable line-up on a separate menu may make  
14 selection easier for viewers with small television screens.

15 Figures 27a and 27b are examples of major menus 1020. In particular, Figures 27a  
16 and 27b show a major menu 1040 whose category is hit movies.

17 The hit movie category is a list of recently released movies which have been found to  
18 be popular among movie goers. This movie list is changed once or twice a week to keep in line  
19 with new movie releases. Again, multi-window and customized window techniques are utilized  
20 to make the menu as user friendly as possible.

21 Figure 27a shows the preferred embodiment of the hit movies menu 1040. The hit  
22 movies menu icon along with the hit movies category letter A are displayed. The current date  
23 and time are displayed at the top of the screen over a menu background. Ten movie selections  
24 are displayed in the center of the screen 1009, each in a box which may be highlighted when  
25 selected. In the lower left part of the screen, a logo window 1512 is available as well as two  
26 other option choices 1011, Movie Library and Return to Cable TV. In an alternate

1 embodiment, the return to Cable TV option is changed to return to the Home menu 1010 (or  
2 return to other viewing choices).

3 In Figure 27b, the left upper window 1002 displays current time and the right upper  
4 window 1004 displays a message. This menu provides a list of eight movie titles and their  
5 rating 1009. If the subscriber desires further information on any particular movie he may select  
6 a movie using the cursor movement buttons and press the "go" button on the remote control  
7 900 or set top terminal 220 box.

8 It is important in creating user friendly interfaces that the menus are consistent and  
9 follow a pattern. A manner of making the menus is discussed below with respect to Figures  
10 55 and 56. This consistency or pattern between the different menus provides a level of comfort  
11 to the subscriber when encountering new menus. In the major menu 1020 example of Figure  
12 27a, the upper sash 1502 and lower sash 1504 remain consistent throughout menus in the  
13 preferred embodiment. The logos 1508, icons 1510 and titles also remain consistent in the  
14 same locations.

15 In the major menu 1020 example of Figure 27b, the customized windows 1002, 1004  
16 in the upper corners remain constant from menu to menu. Also, the name of the menu and  
17 category are at the top and center of the menu screen 1039. To make the menu aesthetically  
18 pleasing, the instructions are given across the center of the screen and choices in large legible  
19 type are provided. Additionally, at the bottom of most menu screens 1011, the subscriber is  
20 given the option of returning to regular TV or returning to the home menu 1010.

21 Figures 27c-27g show alternative embodiments of major menus 1020 for the home  
22 menu shown in Figure 25a. Figures 27c-27g show various major menus directed to the type  
23 of subscription services available (basic service 1420, basic plus 1422, economy package  
24 1424, ala carte and premium channels 1426). These menus also provide promotional or  
25 advertising information, for example, the cost for the particular subscription service. Figure 27g  
26 shows a major menu for the Learning Channel 1428, one of the individual channels shown in  
27 the home menu of Figure 25a.

1           These menus may be grouped in similar colors or shades of colors. For example, the  
2           basic subscription service could have a light pink color. As the subscription services increase  
3           in terms of the number of channels available, the color shading may increase correspondingly.  
4           Therefore, the premium subscription service (ala carte service) would have a dark red color,  
5           contrasting with the light pink color of the basic subscription service.

6           In Figure 27b, the movie titled Terminator 4 is highlighted, signifying that the  
7           subscriber has chosen this program option from the hit movie major menu. Figures 28a and  
8           28b show submenus 1050 which would follow the selection of Terminator 4 on the hit movie  
9           major menu. In Figure 28a, the sash across the top of the screen 1502 remains constant from  
10          major menu 1020 to program description submenu 1050. Again in Figure 28b, for the comfort  
11          of the subscriber, the left upper window 1002 remains the same and shows the current time.  
12          The upper right-hand corner 1004 carries a message stating the next start time for the movie  
13          selected.

#### 14           E.2. Notification

15          Figures 29a and 29b are notification submenus informing the user that his program  
16          selection is about to begin (e.g., counting down until start time). Using this submenu, the set top  
17          terminal 220 warns the user prior to switching him away from the channel he is viewing to a  
18          prior selected program channel. This notification submenu is provided to the subscriber  
19          approximately one or more minutes before the set top terminal 220 changes the viewing  
20          channel.

21          Both notification submenu examples allow the subscriber to cancel his movie order.  
22          In Figure 29a, the subscriber is notified in the center of the screen that he may cancel within the  
23          first five minutes. In Figure 29b the subscriber may press escape to cancel his order without  
24          charge. The notification submenu of Figure 29b informs the user of the start time at the upper  
25          right portion of the screen.

26          The notification submenu of Figure 29b is a simple three-window menu. A strip  
27          window at the top of the screen 1103 notifies the subscriber of the movie selected and the



1 amount of time before the movie will begin. The center window is a large video window 1556  
2 for displaying a scene from the movie. At the bottom of the screen the submenu carries another  
3 strip menu 1105 which informs the user that he may escape from his program selection without  
4 charge.

5 Using a notification submenu 1127, the set top terminal 220 may allow a subscriber to  
6 view other programs prior to his movie start time. The subscriber is amply notified of the start  
7 time of his program and effortlessly moved to the correct channel to view his selected program.  
8 This notification-type submenu may be used to move a subscriber from his current channel to  
9 any preselected channel for viewing a program which has been ordered at an earlier time. In  
10 the preferred embodiment, the amount of time provided by the notification submenu may be  
11 customized by the subscriber to a length of his preference. The notification submenu also  
12 allows a subscriber to cancel or escape from his previously selected program choice and avoid  
13 any charges. If a subscriber cancels or escapes he is returned to the channel that he is currently  
14 watching.

### 15 E.3. Escape Time Expired

16 As shown in Figure 30a, in the preferred embodiment, the subscriber is given a During  
17 Program Menu, specifically an Overlay menu 1130 to inform him when his five minutes of  
18 movie escape time have expired. Once the time has expired the subscriber will be billed for  
19 the movie selection.

### 20 E.4. Escape After Charged

21 Figure 30b is an overlay menu 1133 warning the user that he is escaping a program  
22 after being charged for the order of that program. The warning overlay menu 1133 of Figure  
23 30b follows in sequence and is prompted by a hidden menu which constantly monitors for  
24 subscriber input during viewing of the program. The hit movie hidden menu (not shown)  
25 specifically waits for certain key entries by the subscriber. In particular, the hit movie hidden  
26 menu awaits for a key stroke such as escape, cancel or an icon selection. If the escape button  
27 is depressed during the viewing of a hit movie the overlay menu of Figure 30a or Figure 30b

1 will be shown. A strip menu in the lower sash of Figure 30b allows the subscriber to resume  
2 full screen viewing of the hit movie.

3 Figure 30b is a representative example of an overlay menu 1133. It has a dark lower  
4 background sash and a light colored informational sash. The upper portion of the screen  
5 continues to display the video of the program selected. Figure 30c is a reentry to ordered  
6 selection submenu 1135 for the hit movie category. The reentry to ordered selection submenus  
7 appear whenever a subscriber selects a programming option (program, event, or subscription  
8 channel), that the subscriber has already ordered. This menu has a program title window with  
9 a text title entry, and a description of the order that has already been placed for the program  
10 (or channel). In the preferred embodiment, the submenus which allow reentry to ordered  
11 selection provide the subscriber with the added option of joining the program within any fifteen  
12 minute interval. This special feature of the preferred embodiment allows a subscriber who has  
13 viewed one-half of a particular program to rejoin the program at the half-way point. In this  
14 manner, the program delivery system mimics a VCR tape recording of the program. For  
15 example, if a subscriber had rented a videotape of the movie Terminator 4 and had  
16 watched thirty minutes of the movie, he would have left his videotape in the thirty minute  
17 position.

#### 18 E.5. Reenter Program

19 With the menu of Figure 30c a subscriber to the system who has watched thirty minutes  
20 of Terminator 4 may reenter the Terminator movie at the thirty-one to forty-five minute interval  
21 as shown in Figure 30c. The nine-fifteen minute blocks of the menu display blocks are  
22 representative of the choices available for a two-hour hit movie. Other variations are possible  
23 depending on the length of the movie and the timing intervals desired.

#### 24 E.6. HDTV Promotion

25 Figures 31a and 31b relate to HDTV. Figure 31a is an example of a menu 1032  
26 advertising a new feature of the system. Promotional menus, such as Figure 31a, may be  
27 dispersed throughout the menu driven program selection system. This particular menu

describes the HDTV feature and explains its unavailability until a future date. Figure 31b shows the integration of HDTV services into the menu driven program delivery system. If the subscriber selects the major menu for HDTV, he will either receive a description of the service with a suggestion to order the system, or a text note that he is a current subscriber and a listing of the currently available program selections in HDTV 1232. If the subscriber has not paid to join the particular service, HDTV, he may be allowed to join one of the programs in progress for a limited time as a demo to entice the subscriber to order.

If the subscriber has paid his HDTV fees, a subscriber proceeds as he would in any other major menu screen.

This particular major menu shows an example of how a follow-on or second screen may exist for the same menu. In this particular case, a second screen exists for the major menu HDTV 1032. The subscriber may access the second screen 1232 by selecting the last menu display block in the lower part of the screen "Other HDTV Selections". Following this selection, the subscriber will be given a second screen of program selections. In this manner, any menu can have multiple screens with many program choices. This type of screen pagination on one menu allows the packager to avoid categorizing program selections within that same menu. In an alternative embodiment, the options available to the subscriber may be scrolled on one menu screen with the text within the menu display blocks changing as the subscriber scrolls up or scrolls down.

#### E.7. Programs Available

In the preferred embodiment, TV guide services, listing programs available on network schedules, will be available on a major menu, as shown in Figure 32a. In the preferred embodiment, the major TV guide menu 1036 would offer submenus, such as network schedules for the next seven days, today's network schedules for the next six hours, and TV guide picks for the next seven days. If the particular set top terminal 220 has been subscribed to the TV guide service, the subscriber may proceed to a submenu showing schedules of programs. If the subscriber chooses the network schedule submenu 1236, he is offered a list

1 of network schedules to choose from as shown in Figure 32b. If a subscriber were to choose,  
2 for instance, HBO, the submenu 1238 shown in Figure 32c would appear. This submenu  
3 allows a subscriber to choose the program date that interests him. Following selection of a  
4 date, the subscriber is shown a more specific submenu 1242 listing programs available on the  
5 particular date as shown in 32d.

6 Following a program choice, a program description submenu 1244 is placed on the  
7 television screen as shown in Figure 32e. In addition, from this program description submenu,  
8 the viewer may choose to record the selected program on his VCR using the guide record  
9 feature. If the guide record feature is chosen, the guide record submenu 1248 shown in Figure  
10 32f provides the subscriber with further instructions. In order for the set top terminal 220 to  
11 perform the guide record functions and operate the VCR, control signals must be sent from the  
12 set top terminal 220 to the VCR via the video connection 650 or via a separate connection  
13 between the set top terminal 220 and the VCR. The VCR must be capable of interpreting  
14 these control signals from the set top terminal 220 and performing the desired function (such  
15 as, activating the record feature). In the preferred embodiment, the VCR control signals are  
16 sent with the video signal and output from the output 650, as described above.

17 Figures 32g and 32h refer to the broadcast TV menu option available in Figure 23b.  
18 Figure 32g is a major menu 1046 displaying subcategories of programs available on a group  
19 of channels called generically "broadcast TV." For each subcategory there is a separate  
20 submenu listing programs that are available in the particular subcategory on a group of channels  
21 called broadcast TV.

22 By using the broadcast TV menu, the subscriber does not need a written guide of  
23 available television programming on the major networks. Although the preferred embodiment  
24 categorizes television programs available on the major networks, a simple chronological listing  
25 of programs may also be used.

26 Following a subcategory selection on the broadcast TV menu such as favorite channels,  
27 the set top terminal 220 will display a submenu of programs as shown in Figure 32h. The

1 favorite channel program menu 1256 of Figure 32h allows the subscriber to choose among  
2 eight programs in progress at 9:45 p.m. on a broadcast TV network.

3 Using this methodology, the subscriber may also be allowed to choose among  
4 television programs which will be available for viewing in the next half hour or hour. When the  
5 time of the preselected program is approaching, the set top terminal 220 will display a  
6 notification menu or window to the subscriber (similar to Figure 29a and 29b) informing him  
7 of an eminent change of channels to a previously selected program.

#### 8 E.8. Mood Questions

9 Once a personal profile has been created (in a particular set top terminal 220), it can  
10 be indefinitely stored in nonvolatile memory. A selection at the home menu screen 1010  
11 activates the program selection feature. Following activation of the feature, the set top terminal  
12 220 will present the viewer with a series of brief questions to determine the viewer's mood at  
13 that particular time. For example, the first mood question screen 1260 may ask the viewer to  
14 select whether he desires a short (30 minute), medium (30-60 minute), or long (60 plus minute)  
15 program selection, as shown in Figure 32i. The second mood question screen 1262 requests  
16 the viewer to select between a serious program, a thoughtful program, or a light program, as  
17 shown in Figure 32j. And the third mood question screen 1264 requests whether the user  
18 desires a passive program or an active program, as shown in Figure 32k. The viewer makes  
19 his selection in each question menu utilizing the cursor movement keys and "go" button on his  
20 remote control 900. A variety of other mood questions are possible such as fatigue level of the  
21 viewer.

22 After the viewer has responded to the mood question menus which determine his  
23 mood, the set top terminal 220 finds the best programming matches for the viewer and displays  
24 an offering of several suggested programs to the viewer (three or more programs are preferred)  
25 . The matching algorithm compares the viewer profile data with information about the program  
26 derived from the program control information (or STTCIS) signal, such as show category,  
27 description type, length, etc. Using the personal profile information and mood questions

1 suggested above, the following types of outcomes are possible. If the set top terminal 220 is  
2 presented with a young lady viewer, educated in Boston who watches sitcoms on a regular  
3 basis, and desires a short, light, passive program, a match might be found with the 30-minute  
4 sitcom Cheers, the sitcom Designing Women, and Murphy Brown. Taking another example,  
5 a middle-aged male viewer from the Boston area, wishing a longer length, light, passive  
6 program suggestion might be suggested the New England Patriots game, the Boston Red Sox  
7 game and a science fiction movie.

8 With this program selection feature, the set top terminal 220 can intelligently assist the  
9 specific viewer in selecting a television program. Instead of the set top terminal 220 requiring  
10 an input of personal profile information, the terminal may also "learn" a subscriber's viewing  
11 habits by maintaining historical data on the types of programs the viewer has most frequently  
12 watched. This information can then be fed to the matching algorithm which selects the  
13 suggested television programs.

14 Using this methodology, it is even possible for the set top terminal 220 to suggest  
15 programs for two viewers. By using two sets of viewer profile information, the matching  
16 algorithm can find the best match for joint viewing. For example, the set top terminal 220 can  
17 suggest programs for a couple watching television simultaneously.

#### 18 E.9. Promotions

19 Figures 33a, 33b, and 33c demonstrate the use of promotional menus to sell  
20 subscriptions to services in the system. In particular, Figure 33a is a promotional menu 1304  
21 for Level A interactive services. Level A interactive services offers subscribers additional  
22 information about programs such as quizzes, geographical facts, etc. This information may be  
23 received by the set top terminal 220 in several data formats including VBI and in the program  
24 control information signal. Figure 33b is a promotional menu 1306 for Level B interactive  
25 services which include a variety of on-line type services such as Prodigy, Yellow Pages, Airline  
26 Reservations, etc.

1           Figure 33c is a promotion menu 1308 for the Level C interactive services. The Level  
2           C interactive services utilize local storage such as CD technology to offer an enormous range  
3           of multi-media experiences. The Level C interactive services require a hardware  
4           upgrade as described earlier. Specially adopted CD-I and CD-ROM units are needed for  
5           this service.

6           E.10. Level A Interactive

7           Figures 33d through 33j show menus that are available using the interactive Level A  
8           services. When interactive Levels A services are available in a television program, the system  
9           will display the interactive logo consisting of the letter 'T' and two arrows with semicircular tails.  
10          In the preferred embodiment the set top terminal 220 will place the interactive logo on the  
11          television screen as an overlay menu 1310. In the preferred embodiment, the set top terminal  
12          220 will detect that there is data or information available about a television program which can  
13          be displayed to a subscriber using the interactive service. When the set top terminal 220 senses  
14          that there is interactive information available, it will generate the interactive logo overlay menu  
15          and place it on the television screen. For example, the set top terminal 220 will detect that  
16          information on a television program is being sent in the vertical blanking interval (VBI) and  
17          generate an interactive logo overlay menu which will appear on the subscriber's  
18          television screen for approximately fifteen seconds during each ten minute interval of  
19          programming.

20          When the subscriber sees the interactive logo on his television screen, he is made  
21          aware of the fact that interactive services are available in conjunction with his television  
22          program. If the subscriber presses his interactive remote control button, an additional overlay  
23          menu will be generated by the set top terminal 220 and placed on the screen. This menu 1310  
24          is shown in Figure 33d being overlayed on an interactive television program. From this menu  
25          the subscriber may select interactive features or return to the television program without  
26          interactive features.

1 If the subscriber selects interactive features he will be presented with the interactive  
2 Level A submenu 1312 in Figure 33e. From this submenu the subscriber may choose a variety  
3 of different types of textual interactivity with the current television program. Some examples  
4 are quizzes, fast facts, more info, where in the world, products, etc. At any time during the  
5 interactive submenus the user may return to the television program without interactive features.

6 This interactive submenu has an example of taking a complete television program  
7 video, scaling it down to a smaller size and directing the video into a video window of a  
8 submenu.

9 Figure 33f shows an interactive fast facts submenu 1314. In this submenu textual  
10 information is given to the subscriber in the lower half of his screen. This textual information  
11 will change as additional data is received by the set top terminal 220 relating to this television  
12 program.

13 Figure 33g shows the use of the subcategory "more information" in the interactive  
14 service. This submenu 1316 gives additional information related to the television program to  
15 the viewer in textual form in the lower half of the screen. Figure 33h is an interactive submenu  
16 1318 for the subcategory "quiz." In this interactive subcategory, the user is presented with  
17 questions and a series of possible answers. If the subscriber desires, he selects one of the  
18 answers to the quiz question. After his selection, the set top terminal 220 sequences to another  
19 menu. The set top terminal 220 sequences to the interactive quiz answers submenu which  
20 informs the subscriber whether he has chosen the correct answer or not. Figure 33i shows a  
21 correctly answered quiz question 1320 and Figure 33j shows an incorrectly answered quiz  
22 question 1324. In the preferred embodiment, the menu graphics for both of these menus 33i  
23 and 33j is the same. The only difference is in the text which can be generated by the text  
24 generator of the set top terminal 220.



1           E.11. Level B Interactive

2           Figure 34a is an example of a submenu for Level B interactive services. From this  
3 menu screen 1330, any of a number of on-line data services could be accessed. In Figure 34a,  
4 the airline reservations selection has been selected by the subscriber.

5           E.12. On-Line Data

6           Figures 34b through 34l provide an example of a sequence of menus that a subscriber  
7 may encounter with an on-line data service. In particular, this example relates to airline  
8 information and reservations and the subscriber in this sequence is reserving and purchasing  
9 airline tickets. Figure 34b is an example of the first submenu 1332 for a data service offering  
10 various options. In this case, the subscriber has the option of checking current reservations or  
11 making new reservations. In each of these submenus related to a data service, the subscriber  
12 is able to return to the home menu 1010 or regular cable TV and exit the data service. Figure  
13 34c requires the subscriber to enter information related to his airline reservation in this submenu  
14 1334, such as: domestic or international flight, year of flight reservation, month of flight  
15 reservation.

16           Figure 34d is another submenu in the airline information and reservation data service.  
17 Figure 34d provides an example of how the subscriber may choose among many options on  
18 a single screen 1336. In this manner, the preferred embodiment of the system can avoid the  
19 use of a separate keyboard for textual entry. Although a separate keyboard may be provided  
20 as an upgrade, it is an added expense which some subscribers may wish to avoid. Figure 34d  
21 shows an "eye off the remote" approach to entering information. Figure 34d allows the user  
22 to chose the State in which he will depart and the state in which he will arrive. The airline  
23 information reservation submenu 1338 shown in Figure 34e allows a subscriber to choose the  
24 airports from which he will depart and arrive and also the approximate time period of his  
25 departure and his arrival. Figure 34f, an airline information and reservation submenu 1340,  
26 allows a subscriber to view six available flights. A subscriber may select one of the flights to  
27 check on its availability.

1           Figure 34g, an airline information and reservation submenu 1342, allows a subscriber  
2           to enter the month, day and year for the availability date he desires. In this submenu, the  
3           subscriber is offered the option of correcting any errors in the entered information. This  
4           particular submenu is for a particular flight, including flight number.

5           Figure 34h, an airline information and reservation submenu 1344, allows a subscriber  
6           to view remaining seats available on a flight. From the menu, the subscriber may select his seat  
7           assignments. This submenu is an example of how information may be graphically shown to a  
8           subscriber using a portion of the menu and different coloring schemes. In this menu, the lower  
9           half of the screen shows the passenger compartment of an airplane with all the seat locations  
10          graphically represented by square blocks. By coloring the available seat locations in blue and  
11          the unavailable seat locations in a different color, the menu can present a great deal of  
12          information in a limited amount of space. This graphic presentation of information for the  
13          interactive on-line data services is an important method of visually displaying large amounts of  
14          information to the subscriber.

15          Figure 34i, an airline information and reservation submenu 1346, allows the subscriber  
16          to choose a one-way or round-trip ticket and to confirm his reservations. If the subscriber  
17          desires to proceed, he may charge his airline ticket to his credit card by choosing the  
18          appropriate strip menu on the lower part of the screen.

19          Figure 34j, an airline information and reservation submenu 1348, is an example of how  
20          credit card purchases may be made using the interactive on-line data services. In this particular  
21          menu, the subscriber is charging a round-trip plane ticket on his credit card. The subscriber  
22          simply needs to enter his credit card number, expiration date, and credit card type to charge  
23          his airline ticket.

24          Figure 34k, an airline information and reservation submenu 1350, is an example of a  
25          menu which may be shown whenever an on-line data service is processing a request sent by  
26          the subscriber. In this particular menu, the on-line data service is processing the subscriber's  
27          credit card charge for his airline ticket.

1           Figure 34l, an airline information and reservation submenu 1352, confirms a  
2 subscriber's airline ticket purchase and passes on information on where the ticket may be  
3 picked up.

#### 4           E.13. Digital/Audio Program Choices

5           Figure 35a is a major menu 1038 displaying the digital/audio program choices which  
6 are available for subscribers who have paid the monthly fee. In a chart format, the major menu  
7 shows the top five, top ten, and top forty songs available in six different categories of music.  
8 Below the chart, the system is able to provide a text message describing the particulars of the  
9 audio program selected.

10          The digital/audio feature of the invention allows a subscriber to listen to CD quality  
11 audio selections through his stereo. This can be accomplished by running cables directly from  
12 the set top terminal 220 to the subscriber's amplifier/stereo system. Alternatively, the user may  
13 listen to audio selections through his television system.

14          Figures 35d and 35e are the same major menu 1038 as Figure 35a but shows a  
15 different selection and a different program description in the lower text 1408, 1412. From any  
16 of the menu screens for the digital/audio feature, the subscriber may return to regular cable TV  
17 with the press of a single button.

18          Figures 35b and 35c are promotional menus 1400, 1404 for the digital/audio feature.  
19 Using the same logos and menu format, the system can provide a text description enticing the  
20 subscriber to pay the monthly fee and join the service. In Figure 35b, the menu allows the user  
21 to test the system with a free demonstration. The menu in Figure 35c allows the subscriber to  
22 request additional promotional information about the system. Both Figures 35b and 35c are  
23 representative of promotional menus that may be used throughout the menued system.

#### 24          E.14. Monthly Account Review

25          Figures 36a, 36b and 37a, 37b relate to the monthly account review capabilities  
26 available to the subscriber. In the preferred embodiment, the subscriber may choose to access  
27 the monthly account review capability from both the introductory menu 1000 and home menu

1 1010. The monthly account review screen shows alternative window types that are available  
2 to the set top terminal 220. For example, in the upper left-hand corner of the monthly account  
3 review, the current time and date are both shown. The upper right-hand corner provides the  
4 subscriber with instructions on how to use the monthly account review capability. Figure 36b  
5 also shows that windows may be created in a variety of shapes. For instance, on the lower  
6 right-hand part of the screen 1612 two triangularly shaped windows with messages are shown.  
7 In addition, on the left lower part of the screen 1612 a window in the shape of a trapezoid is  
8 shown with a textual message inside.

9 The monthly account review provides a list of charges from the first day of the month  
10 to the date of viewing for each major menu. Charges are incurred on a pay-per-view basis  
11 and on a subscription basis (weekly, monthly, quarterly, etc.).

12 At the lower part of the screen, the total of the charges incurred for the month is listed. The  
13 account status can also be calculated on a weekly, quarterly or semi-annual basis.

14 If the user moves his cursor to highlight one of the eight menus listed and depresses the  
15 "go" button, he will obtain further billing information on the menu. Figures 36a and 36b show  
16 in screens 1610 and 1612, respectively, the subscriber selecting menu A for further information.

17 Figures 37a and 37b are submenus for the monthly account review and displays  
18 detailed billing information about selections made on menu A. The date of each movie  
19 selection, title of the movie, and price for each movie is displayed (1614, 1616). Also, any  
20 discounts which have been granted are displayed. The total charges on this menu and the day  
21 in which the menu will be changed are shown in the lower part of the screen. From this  
22 submenu, the subscriber may either return to regular TV or return to the major menu for the  
23 monthly account review. If the submenu information does not fit on a single screen, an  
24 extended submenu may be utilized with follow on extension screens. Alternatively, a scrolling  
25 feature may be used enabling the subscriber to scroll additional information onto the first  
26 submenu screen.

1           The account information necessary to create the monthly account review menus may  
2 be stored either in the memory of the set top terminal 220 or at a remote location that  
3 communicates with the set top terminal 220. In the simplest embodiment, the set top terminal  
4 220 records a subscriber's selections locally and calculates the monthly account review based  
5 upon the subscriber's selections which require the payment of fees. This monthly account  
6 information is stored locally and sent to the cable headend 208 at least once a month for back-  
7 up and billing purposes.

8           Alternatively, the subscriber's viewing selections and billing information may be  
9 continuously maintained at the cable headend 208 or a remote site connected via  
10 communication lines to the cable headend 208. The cable headend 208 or the remote site must  
11 regularly transmit the monthly account information to the set top terminal 220. Each  
12 embodiment has advantages and disadvantages. If the account information and processing is  
13 done locally at the set top terminal 220, each set top terminal 220 must be provided with the  
14 memory and necessary processing capability to maintain the account. This greatly increases  
15 the cost of a set top terminal 220. If the account information is maintained remotely, the remote  
16 site must remain in regular contact with the set top terminal 220 in order to provide the  
17 subscriber with billing information.

18           To accommodate homes with multiple viewers two or more set top terminals 220 may  
19 be placed on a single bill or two accounts may be created for one set top terminal 220.

20           F.     Allocation of Cable System Bandwidth

21           One of the primary tasks of the Operations Center 202 is, with assistance from the  
22 cable headends 208, effective utilization of available bandwidth from the Operations Center  
23 202 to the subscriber homes. Figure 14 shows effective allocation of 750 MHz of bandwidth  
24 (1MHz to 750 MHz) for television programming. In Figure 14, bandwidth is allocated for both  
25 analog 226 and digitally compressed 227 signals. In the preferred embodiment, the bandwidth  
26 is divided so that each category of programs receives a portion of the bandwidth. These  
27 categories correspond with major menus of the set top terminal software. The representative

1 categories shown in Figure 14 include: (1) high definition TV (HDTV) made possible through  
2 the use of compression technology, (2) A La Carte Channel category which provides specialty  
3 channels for subscription periods such as monthly, and (3) pay-per-view.

4 Figure 15 shows a chart 228 of compressed channel allocation for a variety of  
5 programming categories 229 that have been found to be desirable to subscribers. By grouping  
6 similar shows or a series of shows into blocks of channels 230, the system 200 is able to more  
7 conveniently display similar programming with on-screen television menus. For example, in the  
8 movie category, which has the greatest allocation of channels, the same movie may be shown  
9 continuously and simultaneously on different channels. Each channel starts the movie at a  
10 different time allowing the subscriber to choose a more suitable movie starting time (e.g., every  
11 15 minutes).

12 In order to accommodate cable TV systems that have different bandwidths and channel  
13 capacities, the television programming and television program control information may be  
14 divided into parts such as priority one, two and three. The large bandwidth cable TV systems  
15 can accommodate all the parts of the television programming and all parts of the television  
16 programming control information. Those cable TV systems with a more limited bandwidth are  
17 able to use the program delivery system 200 by only accepting the number of parts that the  
18 cable system can handle within its bandwidth.

19 For instance, as is shown in Figure 16, three cable television systems with different  
20 bandwidths may use the program delivery system 200 simultaneously with each system  
21 accepting only those parts of the information sent which it is capable of handling. Priority one  
22 television programming and menus 240 are accepted by all three systems. Priority two  
23 television programming and menus 242 are not accepted by the cable television system whose  
24 capacity is the smallest or in this case 330 MHz (40 channels) system. Priority two television  
25 programming and menus 242 are accepted and used by the two larger capacity cable television  
26 systems shown. Priority three television programming and menus 244 are only used by the

1 largest capacity television system which is capable of handling all three parts -- Priority one,  
2 two and three programming and menu information.

3 With this division of television programming and menus, the program delivery system  
4 200 may be utilized simultaneously by a variety of concatenated cable systems 210 (depicted  
5 in Figure 1) with varying system capacities. By placing the heavily watched or more profitable  
6 programming and menus in the priority one division 240, both users and owners of the cable  
7 TV systems will be accommodated as best as possible within the limited bandwidth.

8 Figure 17 shows three different cable headend 208 systems, each system receiving the  
9 entire satellite signal from the Operations Center 202 and stripping those parts of the signal  
10 which cannot be handled by the local cable system due to bandwidth limitations. In this  
11 particular embodiment, the three local cable television systems shown have bandwidth  
12 limitations which correspond with the bandwidth limitations depicted in the previous Figure 16.  
13 As the bandwidth decreases, the programming options available to the viewer in the exemplary  
14 on-screen menu decreases. Using this preferred embodiment, the Operations Center 202 is  
15 able to send one identical signal to the satellite 206 that is sent to all the cable headends 208.  
16 Each cable headend 208 accepts the entire signal and customizes the signal for the local cable  
17 system by stripping those portions of the Operations Center signal that are unable to be handled  
18 by the local cable system. An alternate embodiment (not shown) requires the Operations  
19 Center 202 (and uplink sites 204) to send different signals for reception by different capacity  
20 cable headends 208.

21 There are several ways in which a cable headend 208 may strip the unnecessary signal  
22 from the Operations Center 202. A person skilled in the art will derive many methods from  
23 the three examples discussed below. The first method is for the signal originating from the  
24 Operations Center 202 (and uplink site 204) to be sent in portions with each portion having a  
25 separate header. The respective cable headend 208 would then recognize the headers and  
26 transmit to the concatenated cable system 210 only those signals in which the proper headers  
27 are identified. For example, using three concatenated cable systems shown in Figure 17, the

1 headers may be "001," "002," and "003." A wide bandwidth concatenated cable system can  
2 accept program signals with all three headers, while the narrowest bandwidth concatenated  
3 cable system may only be able to accept signals with a "001" header. For this first method, a  
4 central Operations Center 202 must divide the program signal into three parts and send a  
5 separate leading header before each signal for each part. This method requires has the  
6 additional signal overhead of a header on the program signal. The header would be transmitted  
7 from time to time as necessary.

8 A second method requires a set of transponders to be assigned to each priority level  
9 and the cable headend 208 to route signals from the transponders corresponding to the proper  
10 priority level for the concatenated cable system 210. For example, if there are three priority  
11 levels and eighteen transponders, transponders one through nine may be assigned to priority  
12 level one, transponders ten through fourteen priority level two, and transponders fifteen through  
13 eighteen assigned to priority level three. Thus, a concatenated cable system 210 capable of  
14 operating only at priority level two, would only receive signals from transponders one through  
15 nine, and ten through fourteen from the respective cable headend 208. The program signal  
16 from transponders fifteen through eighteen would not be transmitted to the priority level two  
17 concatenated cable system. This method requires the Operations Center 202 to properly  
18 assign programs to transponders by priority level. This can be accomplished by the CAP using  
19 the software described earlier (e.g., Figure 8 at 438 and 440).

20 The third and the preferred method is for the cable headend 208 to pick and choose  
21 programming from each transponder and create a customized priority one, two, and three signal  
22 with chosen television programming. The cable headend 208 would then route the appropriate  
23 customized signal to each part of the concatenated cable system 210 that the cable headend  
24 208 serves. This third method requires that the cable headend 208 have a component, such  
25 as the combiner (described in greater detail in U.S. Patent Application Serial Number  
26 08/160,283, filed December 2, 1993, entitled DIGITAL CABLE HEADEND FOR A  
27 CABLE TELEVISION DELIVERY SYSTEM, now U.S. Patent No. 5,682,195, which can



1 select among programs prior to combining the signal for further transmission on a concatenated  
2 cable system 210. The third method requires the least coordination between Operations  
3 Center 202 and the cable headend 208.

4 In addition to dividing the television programming and menus into parts, the Operations  
5 Center 202 of the preferred embodiment is also capable of dynamically changing the bandwidth  
6 allocation for a particular category of programming. Figure 18 depicts this dynamic change in  
7 bandwidth allocation from a typical week day prime time signal 250 to a Saturday afternoon  
8 in October signal 252 (during the college football season). Figure 18 highlights the fact that the  
9 bandwidth allocated to sports is limited to eight selections 251 during week day prime time 250  
10 but is increased to sixteen selections 253 during a Saturday afternoon in October 252. This  
11 dynamic increase in bandwidth allocation allows the system to accommodate changes in  
12 programming occurring on an hourly, daily, weekly, monthly, seasonal and annual basis.

13 In addition to dynamically allocating bandwidth for programming categories, the  
14 Operations Center 202 can also dynamically change the menu capacities in order to  
15 accommodate the change in programming and bandwidth. For example, on a Saturday  
16 afternoon in October 252, the major menu for sports may include a separate subcategory for  
17 college football. This subcategory would, in turn, have a separate submenu with a listing of  
18 four, six, eight, or more college football games available for viewing. In order to accommodate  
19 this dynamic menu change, the Operations Center 202 must add a submenu listing to the major  
20 sports menu, create a new or temporary submenu for college football, and allocate the  
21 necessary menu space on the college football submenu.

22 Once the television programs have been packaged and a program control information  
23 signal is generated to describe the various categories and programs available, the packaged  
24 programs are then digitized, compressed, and combined with the program control information  
25 signal. Upon the signal's departure from the Operations Center 202 the breakdown  
26 into categories is insignificant and the signal is treated like any other digitally compressed  
27 signal

1           G.     Compressing and Transmitting Program Signals

2           After packaging, the packaged television program signal is prepared for satellite  
3 transmission and sent from the Operations Center 202 to the cable headend 208 via satellite  
4 206. Depending on the specific embodiment, the television program signal may need to be  
5 compressed, combined/multiplexed, encoded, mapped, modulated, upconverted and amplified.  
6 This system, which is intended to be compatible with existing C and Ku Band satellite  
7 transmission technologies, accepts video, audio and data signals ranging in signal quality, and  
8 input from a number of sources.

9           As shown in Figure 3, in the preferred embodiment, the packaged program signal will  
10 be treated at a master control uplink site 211 prior to being transmitted to the satellite 206.  
11 Following compression the channels must be multiplexed for each transponder carrier and sent  
12 to the satellite 206 dish that will provide the uplink. A variety of multiplexing schemes may be  
13 used in the system. In some situations, it may be advantageous to use different multiplexing  
14 schemes in different parts of the overall system. In other words, one multiplexing scheme may  
15 be used for satellite transmission 206 and a second remultiplexing scheme for the land  
16 transmission. Various satellite multi-accessing schemes and architectures can be used with the  
17 system, including both single channel per carrier (SCPC) frequency division multiplex (FDM)  
18 and multiple channel per carrier (MCPC) time division multiplexing (TDM). Time division  
19 multiplexing is the more desirable scheme.

20           Once the signal has arrived at the uplink or master control site 211, it must be  
21 modulated, upconverted, and amplified. Various types of satellites and transponders capable  
22 of handling digital signals may be used in this cable television packaging and delivery system.  
23 One of the achievements of the present invention is effective utilization of digital compression  
24 technology by packaging television programs into categories that allow easy access to television  
25 programs by consumers. With current digital compression techniques for video, the typical  
26 50-channel capacity cable satellite receiving system can be increased to 300 channels.

1           Presently, one transponder is used for each satellite delivered channel. The preferred  
2           embodiment uses 18 satellite transponders and compression ratios of 4:1 to 8:1 to achieve a  
3           capacity of 136 satellite delivered channels. More transponders or higher compression ratios  
4           can be used to deliver up to the channel capacity of any existing cable system.

5           An example of a satellite that may be used is the AT&T Telstar 303. The signal is  
6           transmitted from the satellite 206 to the cable headend 208 where a computer system including  
7           a digital switch treats the signal and delivers it through cables to a subscriber's home. In  
8           alternate embodiments, multiple Operations Center 202 and multiple uplink sites 211 can be  
9           simultaneously utilized.

#### 10           H.     Cable System Use of Control Signal

11           Figures 19 through 21 depict sample menu screens produced by the set top terminal  
12           220 using the program control information signal 276. Figure 19 shows a menu which enables  
13           the viewer to select a program category or program service from among a choice of eight  
14           program categories. Figure 20 shows a menu for the viewer to select a hit movie from among  
15           ten hit movies. Figure 21 provides information about a movie (or event) and enables a viewer  
16           to order the movie for viewing.

17           Figure 19 through 21 show text generation by the set top terminal 220. This text is  
18           generated using information received via the program control information signal. Figure 20  
19           shows the text 380 generated for the hit movies major menu. In the preferred embodiment, text  
20           380 such as that shown in Figures 19 through 21 is generated separately by a text generator  
21           (not shown) in the set top terminal unit 220. Those portions of the text that generally remain  
22           unchanged for a period of weeks or months may be stored in EEPROM or other local storage.  
23           For example, the text "HIT MOVIES from" 382 will consistently appear on each hit movies'  
24           major menu. This text may be stored on EEPROM or other local storage. Further, text such  
25           as that which appears at the lower center part of the screen "PRESS HERE TO RETURN TO  
26           CABLE TV" 384 appears many times throughout the menu sequence. This text may also be  
27           stored locally at the set top terminal 220. Text which changes on a regular basis, such as the

1 movie titles (or other program selections), will be transmitted to the set top terminal 220 by  
2 either the operations center 202 or the cable headend 208. In this manner, the cable headend  
3 208 may change the program selections available on any major menu modifying the program  
4 control information signal sent by the operations center 202 and transmitting the change. The  
5 network controller 214 of the cable headend 208 generally modifies the program control  
6 information signal and transmits the set top terminal control information signal (STTCIS). It is  
7 preferred that the text 380 is generated by the set top terminal 220 separately from the graphics  
8 because the text can be stored locally in a more compact manner requiring less storage space  
9 at the set top terminal 220. In addition, it allows for easy communication of text changes from  
10 the operations center 202 or cable headend 208 to the set top terminal 220.

11 Figures 19 through 21 show the use of day, date and time 386 information on menus.  
12 This information may be obtained in a variety of ways. The day, date, and time information 386  
13 may be sent from the operations center 202, the cable headend 208 (signal processor or  
14 network controller 214), the uplink site, or generated by the set top terminal unit 220 internally.  
15 Each manner of generating the day, date, and time information 386 has advantages and  
16 disadvantages which may change given the particular embodiment and costs. In the preferred  
17 embodiment, the day, date, and time 386 are generated at a central location such as the  
18 operations center 202 and are adjusted for regional changes in time at the cable headend 208.

19 In order for the set top terminal 220 to generate submenus for subcategories of  
20 categories shown in Figure 19 (which relate to the content of the programs), and to generate  
21 menus for movies such as Figure 21, the terminal must receive information on the content of the  
22 programs from the Operations Center 202 (via the cable headend 208). Normally the set top  
23 terminal 220 would receive this information in the form of the program control information signal  
24 (or STTCIS). As shown figure 21, in addition to the text needed for these program menus,  
25 video or program scenes are also necessary.

26 Live video signals may be used in windows of certain menus such as Figure 21. These  
27 video signals can be sent via the program control information signal, STTCIS, or can be taken

1 off channels being transmitted simultaneously with the menu display. If the video signal is taken  
2 off a channel, less information needs to be sent via the program control information signal.  
3 However, this technique requires that separate decompression hardware be used for the  
4 program control information and the channel carrying the video. Separate decompressors for  
5 the video signals and program information signal allows for the greatest flexibility in the system  
6 and is therefore the preferred embodiment. A separate decompressor also assists in assuring  
7 that the switch from menus to television programming is smooth and without any significant time  
8 delay.

9 Live video for menus, promos or demos may be sent to the set top terminal 220 in  
10 several ways: a) on a dedicated channel, b) on a regular program channel and scaled to size,  
11 c) sent along with the program control information signal, etc. However, in the preferred  
12 embodiment, a great deal of short promos or demo video are sent using a split screen technique  
13 on a dedicated channel.

14 Using a split screen technique, any number of different video clips may be sent (e.g.,  
15 2, 4, 6, or 8 video clips). To show the video clip on a menu, the video must either be scaled  
16 and redirected to a video window on a menu screen or a masking methodology can be used.  
17 Masking involves playing the entire channel of video (all 2, 4, 6, or 8 split screens) in  
18 background and masking the unwanted video clip portions of the split screen by playing the  
19 menu in foreground and overlaying the unwanted background video. Masking is the least  
20 expensive method because it does not require any special hardware and it increases video  
21 throughput to the set top terminal 220. However, using the masking technique without any  
22 video redirecting causes each video clip to be located in a different position on the screen. It  
23 also requires the masking to be different for each video clip and makes consistent format  
24 difficult. On the other hand, scaling and redirecting video is generally difficult, expensive and  
25 requires additional hardware.

26 In order for the Operations Center 202 to prepare the promo video signal to be sent  
27 to the set top terminal 220, the Operations Center 202 must first identify the duration and actual

1 video cut to be used for each promo and its position within the promo video signal. This  
2 information is maintained within the Operations Center 202 database. When it is time to  
3 produce the promo video signal (either to tape or to broadcast), each promo cut is scaled,  
4 positioned and combined with the other promos to form the single promo video signal. This  
5 is performed by readily available commercial equipment. Each promo is run repeatedly while  
6 the promo video signal is being generated. The audio signals of the individual promo cuts may  
7 be combined into the promo video signal audio tracks based upon the number of audio tracks  
8 available. The mapping of the audio tracks to the promos is also stored in the Operations  
9 Center database. Additionally, the mapping of promos to the programs that they are  
10 previewing is also stored in the Operations Center database. All promo database data is made  
11 available to the set top terminal 220 through the STTCIS.

12 In the preferred embodiment, the Operations Center 202 transmits six video/graphic  
13 promos for advertising purposes all on one channel. The throughput of the video/graphics on  
14 a single channel can be increased through the use of digital compression techniques. The set  
15 top terminal 220 uses either video scaling and redirecting techniques or masking to utilize the  
16 six video scenes. Although the set top terminal 220 actually performs the manipulation of video  
17 as necessary to generate the "live" menus for the subscriber, the appropriately prepared  
18 video signals must be formed and sent by the Operations Center 202 to the set top terminal  
19 220.

20 If a promo for a given program is available at the set top terminal 220, the viewer may  
21 command the set top terminal 220 to display the promo. Generally, this is done through  
22 program selection from a menu screen by the subscriber. The selected program is referenced  
23 to information about available promos and allows the set top terminal 220 to tune to the proper  
24 channel, select the appropriate menu overlay mask based on the promos position and switch  
25 on the audio track(s) if they are available. The promos position on the screen dictates the  
26 displaying of the "live" text (refer to the video window of Figure 21). The program associated

1 with the currently selected promo may be purchased from this menu screen. Events, services  
2 and slices of time may be purchased from promotional menus.

3 Management of promo video signals at the Operations Center 202 is similar to that of  
4 other programs except that more information is needed in order to specify the details of the  
5 promo video signal. The broadcasting of the promo video signal is identical to the broadcasting  
6 of a video program.

7 In order to limit the amount of bandwidth needed to transmit the program control  
8 information signal, various compression techniques employed for non-video may be used such  
9 as block coding, contour coding, blob encoding, and run-length encoding. Further, the  
10 program control information signal may be divided into text and graphics, or video, text and  
11 graphics and then recombined at the set top terminal 220 using a text generator, graphics  
12 decompression, and video decompression as necessary.

13 As shown in Figure 2, an analog cable TV system 205 can continue to exist alongside  
14 and within the digitally compressed system of the present invention. The digital transmissions  
15 do not effect the analog system. In fact, the analog cable signal may be transmitted  
16 simultaneously on the same cable as the digital signal. Cable headends 208 may continue to  
17 supply subscribers with local channels in an analog signal format.

18 In the preferred embodiment, the Operations Center 202 and uplink 204 (Figure 1)  
19 or master control site 211 (Figure 3) are collocated. However, the Operations Center 202 and  
20 uplink site 204 may be located in different geographical places. Also, functions and equipment  
21 within the Operations Center 202 may be remotely located. For instance, the program storage  
22 may be at a different site and the programs may be sent to the CAP 260 via landline.

23 Alternate embodiments of the system 200 of the present invention may use multiple  
24 Operations Centers described above. In such an embodiment, it is preferred that one  
25 Operations Center be designated the Master Operations Center and all other Operations  
26 Centers be Slave Operations Centers. The Master Operations Center performs the functions  
27 of managing and coordinating the Slave Operations Centers. Depending on the method in

1 which the Slave Operations Centers share functions, the Master Operations Center  
2 coordination function may involve synchronization of simultaneous transmissions from multiple  
3 Slave Operations Centers. To perform its functions, the Master Operations Center may  
4 include a system clock for synchronization.

5 An efficient method of dividing tasks among multiple Operations Centers is to assign  
6 specific satellite transponders to each Operations Center 202 and to assign external program  
7 sources to the nearest Operations Center 202. Of course, this division of resources may not  
8 always be possible. Since programming will be grouped into priority levels with each priority  
9 level likely to be assigned specific satellite transponders, it is also possible to assign each  
10 Operations Center 202 to a priority level. For example, in a three priority level system with  
11 two Slave Operations Centers A and B and 18 transponders, the Master Operations Center  
12 may be assigned priority level 1 and assigned 9 transponders. Slave Operations Center A may  
13 be assigned priority level 2 and 5 transponders, while Slave Operations Center B is assigned  
14 priority level 3 and 4 transponders. In a multiple Operations Center configuration dynamic  
15 bandwidth allocation and dynamic menu capacity allocation becomes more complex and will  
16 be coordinated by the Master Operations Center.

17 Just as in the alternate embodiment wherein multiple Operations Centers 202 are used,  
18 a delivery system may have multiple satellite uplinks. Preferably, each Operations Center 202  
19 has one or more uplink sites. Each Operations Center 202 controls the functions of its assigned  
20 uplink sites and may assign one site as a master uplink site.

21 In another alternative configuration, in regions or areas without cable services, where  
22 subscribers might use backyard satellite systems (TV RO) to receive packaged television  
23 services, the set top terminal 220 will include the appropriate hardware to allow connection to  
24 the backyard satellite reception equipment, i.e., a typical communication port. In this  
25 configuration, the backyard satellite system will receive programming signals originating from  
26 the Operations Center 202 directly from the satellite transponders. No cable headend 208 is  
27 utilized with a backyard satellite system. The menu system within the set top terminal 220 will



1 be programmed directly from the Operations Center 202. The Operations Center program  
2 signals and control signals arrive at the set top terminal 220 essentially unchanged. Additionally,  
3 in this configuration, an upstream communication mechanism (e.g., modem) must be in place  
4 at the subscriber's home to communicate information to the Operations Center 202 such as  
5 program ordering information. The set top terminals 220 can be equipped with a modem port  
6 for this upstream communication to the Operations Center 202. The two alternative  
7 embodiments described in the preceding four paragraphs, and other such embodiments not  
8 specifically referred to herein but within the understanding of those skilled in the art, incorporate  
9 or combine one or more of the components of the system 200 of the present invention.

10 Although the present invention has been shown and described with respect to preferred  
11 embodiments, various changes and modification that are obvious to a person skilled in the art  
12 to which the invention pertains are deemed to lie within the spirit and scope of the invention as  
13 defined by the following claims.

CLAIMS

What is claimed is:

1. An apparatus for packaging programs in a television program delivery system, comprising:

a central processor unit (CPU), the CPU comprising program instructions for packaging programs for delivery using the television program delivery system;

a program storage database coupled to the CPU, wherein the programs are stored for packaging;

a viewer information database coupled to the CPU, wherein viewer information is stored;

an external program source coupled to the CPU, wherein external programs are received at the apparatus; and

a delivery control processor unit (DCPU) coupled to the CPU, wherein a program control information signal is generated.

2. The apparatus of claim 1, wherein the CPU further comprises:

a packager data entry interface, comprising:

a program selection module used to interactively select programs for delivery;

a program start time module used to select program start times;

a price setting module used to set program prices;

a transponder allocation module used to allocate transponder space; and

a menu editing module used to construct a program menu.

3. The apparatus of claim 1, wherein the CPU further comprises:

a marketing information interface, comprising:

a programs watched information module that receives programs

watched information for terminals in the television program delivery system;

1 a marketing information module that receives marketing information  
2 including viewer demographic information; and  
3 an algorithms module that analyzes the programs watched information and the  
4 marketing information.

5 4. The apparatus of claim 3, wherein the marketing information interface comprises a yield  
6 management subsystem, wherein the yield management subsystem determines an optimum time  
7 to broadcast a specific program in the television program delivery system.

8 5. The apparatus of claim 4, wherein the optimum time is based on maximizing expected  
9 programs watched data for the specific program.

10 6. The apparatus of claim 4, wherein the optimum time is based on maximizing viewer buy  
11 rates for the specific program.

12 7. The apparatus of claim 4, wherein the yield management system further determines an  
13 optimum mix of programs for delivery on the television program delivery system, and wherein  
14 the optimum mix of programs is based on one or more of program substitutes, program  
15 complements, time slice positioning, program repetitions, transponder availability, and menu  
16 positioning.

17 8. The apparatus of claim 1, wherein the television program delivery system includes a  
18 cable television system, and further comprising a cable franchise information access module  
19 (CFIA), the CFIA, comprising:

20 a headend information module that analyzes information related to one or more  
21 specific cable headends, the information including one of a number of terminals connected to

1 the cable headend, grouping of terminals, terminal configurations, and cable headend  
2 equipment; and

3 a cable franchise control signal generator that generates cable headend specific  
4 information, wherein the cable headend specific information is integrated with the program  
5 control information signal.

6 9. The apparatus of claim 1, further comprising:

7 a process menu configurations module that determines menu formats and positions  
8 programs on menu screens;

9 a menu display module that provides a menu display; and

10 a menu edit module that provides on-the-fly menu editing.

11 10. The apparatus of claim 1, further comprising:

12 a graphical transponder allocation display module that shows transponder allocation  
13 across the television program delivery system;

14 an editing transponder allocation module that provides interactive reallocation of  
15 transponder space; and

16 a video packaging module that packages the program control information signal and  
17 the programs.

18 11. The apparatus of claim 1, further comprising:

19 a process program line-up module that develops a program lineup, wherein  
20 importance weighting algorithms and best fit time algorithms are used to assign programs to time  
21 slots.

22 12. The apparatus of claim 11, wherein the process program line-up module,  
23 comprises:

1 a source creation module that processes source materials, wherein the source materials  
2 include materials from internal sources and external sources, and wherein the source material  
3 includes one or more of audio, video, text and multimedia material;

4 a program creation module that creates programs based on the processed source  
5 materials;

6 an event creation module that creates events comprising one or more programs;

7 a service creation module, wherein a service includes one or more events, the service  
8 creation module assigning run times and dates for each service, and checking for conflicts; and

9 a menu creation module that adds event and service information to a menu.

10 13. The apparatus of claim 1, wherein the programs comprise one or more of television  
11 programs, advertisements, promotionals, infomercials, interactive programs, and Internet access  
12 programs.

13 14. A method for packaging programs for delivery to one or more terminals in a network,  
14 comprising:

15 collecting user information for one or more users in the network;

16 receiving program information related to available programs;

17 determining a program lineup based on the collected user information and the program  
18 information; and

19 providing the program lineup to one or more of the terminals.

20 15. The method of claim 14, further comprising broadcasting the programs to the terminals  
21 in the network, the broadcast arranged according to the program lineup.

22 16. The method of claim 14, wherein the determined program lineup is a unique program  
23 lineup determined for each terminal in the network, further comprising:

1 receiving a program selection from a user, the program selection based on the unique  
2 program lineup; and  
3 providing the selected program to the user.

4 17. The method of claim 14, wherein the determined program lineup is a one of a plurality  
5 of group program lineups, each of the group program lineups determined based on information  
6 for a group of users, further comprising broadcasting programs to the terminals in the network,  
7 the programs arranged according to one or more of the plurality of group program lineups.

8 18. The method of claim 17, wherein a group of users are serviced by a cable television  
9 headend.

10 19. The method of claim 14, wherein each of the plurality of group program lineups and  
11 the broadcast programs are provided in a separate program channel.

12 20. The method of claim 14, wherein the user information comprises:  
13 programs watched information;  
14 user demographic information; and  
15 user-provided data.

16 21. The method of claim 20, wherein the programs watched data comprises:  
17 programs purchased information;  
18 program viewing times; and  
19 channel tuning information.

20 22. The method of claim 20, further comprising:  
21 analyzing the user information to determine an optimum program lineup; and

1 packaging programs for broadcast according to the optimum program lineup.

2 23. The method of claim 14, wherein the program lineup comprises a program control  
3 information signal, the program control information signal, comprising:

4 program category information, including names of program categories;

5 channels assigned to program categories;

6 programs available on each of the channels;

7 program start/stop time and duration;

8 program description; and

9 sample video clips for advertisement of a program.

10 24. The method of claim 21, further comprising generating a program menu based on the  
11 program control information signal, wherein the subscriber selects a program for viewing based  
12 on the program lineup shown in the program menu.

13 25. The method of claim 14, wherein the program lineup includes local avails, wherein local  
14 program sites insert local programs in the local avails.

15 26. The method of claim 14, wherein the program lineup and the programs are provided  
16 directly to the terminals.

17 27. The method of claim 26, wherein the program lineup and the programs are provided  
18 over a satellite distribution system.

19 28. The method of claim 27, wherein the satellite distribution system is a C band system.

20 29. The method of claim 27, wherein the satellite distribution system is a Ku band system.

1 30. The method of claim 26, wherein the program lineup and the programs are provided  
2 over the Internet.

3 31. The method of claim 26, wherein the program lineup and the programs are provided  
4 over a cable television system.

5 32. The method of claim 26, wherein the program lineup and the programs are provided  
6 using over-the-air broadcast.

7 33. The method of claim 26, wherein the program lineup is provided using a first  
8 communications device and the programs are provided using a second communications  
9 device.

10 34. The method of claim 33, wherein the first communications means is a dedicated  
11 channel.

12 35. The method of claim 33, further comprising:  
13 providing menu format information to the terminals, wherein the terminals use the  
14 program control information signal and the menu format information to generate an original  
15 program menu for display at the terminal; and  
16 providing revised menu format information to the terminals, wherein the revised menu  
17 format information is used to generate a program menu having a format different from the  
18 original program menu.

19 36. The method of claim 14, wherein the programs comprise:  
20 interactive services;  
21 subscription services; and



1 data services.

2 37. The method of claim 36, wherein the data services comprise connection to an Internet  
3 Service Provider.

4 38. The method of claim 36, wherein the data services comprise electronic commerce  
5 services including online services for reservation of airline seats.

6 39. The method of claim 36, wherein the subscription services are based on a calendar  
7 period.

8 40. The method of claim 36, wherein the interactive services include educational programs  
9 and games.

10 41. The method of claim 14, further comprising optimizing the program lineup, the  
11 optimization, comprising:

12 receiving marketing information related to the available programs;  
13 determining a program importance for each of the available programs;  
14 assigning a weighting factor to each of the available programs; and  
15 positioning each of the available programs within the program lineup.

16 42. The method of claim 41, further comprising:  
17 computing a yield management value for the program lineup, wherein the programs are  
18 positioned in the program lineup to maximize the yield management value.

19 43. The method of claim 41, further comprising:

1           computing a yield management value for one of the available programs, wherein the one  
2           available program is positioned in the program lineup to maximize the yield management value.

3           44.    The method of claim 43, wherein the marketing information comprises program profit  
4           value and program viewed information.

5           45.    A system for packaging and delivering programs to remote terminals, comprising:  
6           a master operations center, comprising:

7                   a central processor unit (CPU), the CPU comprising program instructions for  
8                   packaging programs for delivery to terminals coupled to the television program delivery  
9                   system, and

10                   a program storage database coupled to the CPU, wherein the programs are  
11                   stored for packaging; and

12                   one or more slave operations centers operably connected to the master operations  
13           center, each of the one or more slave operations centers, comprising:

14                   a local CPU,

15                   a viewer information database coupled to the local CPU, wherein viewer  
16                   information is stored,

17                   an external program source coupled to the local CPU, wherein external  
18           programs are received,

19                   a delivery control processor unit (DCPU) coupled to the local CPU, wherein  
20           a program control information signal is generated, and

21                   one or more uplink sites for transmitting the program control information signal  
22           and the programs to the remote terminals.

23           46.    The system of claim 45, wherein the master operations center, comprises:

1 a synchronization module that controls transmissions from the one or more slave  
2 operations centers, the synchronization module including a system clock; and  
3 a transponder assignment module that assigns specific transponder space to each of  
4 the one or more slave operations centers.

5 47. The system of claim 45, wherein the remote terminals include cable television  
6 headends.

7 48. The system of claim 45, wherein the remote terminals include television  
8 terminals.

9 49. A method for optimizing program packaging in a program delivery system, comprising:  
10 selecting one or more programs for packaging;  
11 determining program start times and dates;  
12 allocating transponder space;  
13 setting program prices;  
14 generating a program menu;  
15 generating a program control information signal;  
16 packaging the programs and the program control information signal; and  
17 transmitting the packaged programs and the program control information signal.

18 50. The method of claim 49, further comprising:  
19 selecting types of program for packaging; and  
20 adding additional program elements.

1        51.     The method of claim 49, wherein the program types include static programs, interactive  
2        programs, pay per view programs, live event programs, data services, and subscription  
3        programs.

4        52.     The method of claim 51, wherein the data services include connection to an Internet  
5        Service Provider.

6        53.     The method of claim 49, further comprising:  
7                generating cable franchise information; and  
8                combining the cable franchise information with the program control information signal  
9        and the programming package.

10       54.     A method for packaging programs for delivery over a television program delivery  
11       network, comprising:  
12                developing a program schedule and a program menu;  
13                identifying time slots for local avails;  
14                editing the program schedule and the program menu;  
15                identifying external programs, comprising:  
16                        gathering programs from external sources, and  
17                        converting the external programs to a standard format;  
18                identifying internal programs, comprising:  
19                        accessing stored programs, and  
20                        converting the stored programs to the standard format;  
21                identifying live programs, comprising signaling needed live program signal feeds;  
22                combining the external programs, the internal programs and the live programs;  
23        and  
24                generating a program control information signal based on the combined programs.

- 1        55.     The system of claim 54, further comprising:
- 2             obtaining franchise information; and
- 3             using the franchise information and the combined programs to generate the program
- 4     control information signal.

006750-16346960

**ABSTRACT**

1  
2           An apparatus and a method provide optimum packaging of programs for delivery over  
3 a television program delivery system. The apparatus includes a central processor unit (CPU)  
4 that is used to select program categories and identify external and internal programs. For  
5 packaging. The CPU includes advanced features to weight programs according to established  
6 criteria including previous buying history, programs watched data, and viewer demographics.  
7 The CPU formats a menu having a program lineup and assigns transponder space. Other  
8 advanced features include the use of multiple operations centers to support the packaging,  
9 delivery of the packaged programs to cable television headends, insertion of local avails, and  
10 direct transmission of program packages to individual television terminals.

006T50" T634590